

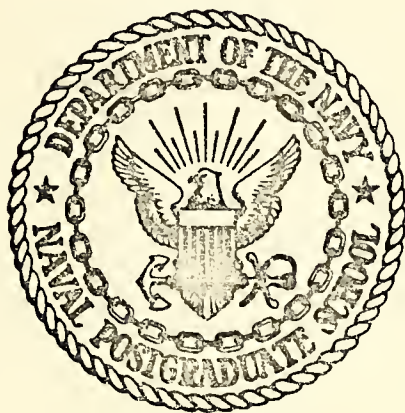
DATA ANALYSIS TECHNIQUES FOR A CONTAINERIZED
EXPORT CARGO TRANSPORTATION SYSTEM

Thomas Joseph McCarthy

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THESIS

DATA ANALYSIS TECHNIQUES FOR A CONTAINERIZED
EXPORT CARGO TRANSPORTATION SYSTEM

by

Thomas Joseph McCarthy
and
James Jefferies Carter

June 1974

Thesis Advisor:

J. P. Hynes

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EXPORT CARGO TRANSPORTATION SYSTEM

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1974

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ABSTRACT

This thesis explains various analytical techniques utilized during research work on the containerized export cargo transportation system at the Military Ocean Terminal, Bay Area, Oakland, California (MOTBA). A series of six computer programs were written in order to summarize data for a distribution audit, while another two programs summarized the data generated from a container stuffing simulation model. The nature of the containerized export cargo transportation system is first described to provide a basis for the identification of relevant variables. A distribution audit is then accomplished to analyze significant variables. Following this, the simulation model provides data for an analysis of the variations and interrelationships among performance variables. The result of these procedures shows that the average age of cargo at stuff is determined by a combination of variables, each of whose significance is related to the degree of activity at the container stuffing station for an individual POD or consignee.

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TABLE OF DEFINITIONS

Break-Bulk Point - Overseas facilities that unstuff mixed cargo shipping containers and distribute the cargo to consignees.

Checker, receiving - Employee of stuffing contractor who receives cargo, signs source documents, matches and verifies documentation (CARDPACS) with cargo, and annotates any discrepancies or omissions on CARDPACS and source documents.

Checker, vanning - Employee of stuffing contractor who tallies cargo loaded into containers, collects and verifies CARDPACS, and prepares TCMD for van master and for splits.

Coder - CDD employee responsible for screening of source documents and for extracting and/or verifying data for preparation of CARDPACS and for computer input.

Consignee - Government facility or installation overseas that is final recipient of exported cargo.

Consignor - Commercial vendor or DOD Depot that originates the shipment of export cargo.

Consolidation - Loading of a shipment unit by stuffing contractor into a container, usually a seavan.

Contractor, stuffing - Firm with responsibility by written contract for stuffing the containers.

Disposition - Refers to type of transaction which terminates MOTBA's accountability for the shipment. Normally refers to lifts, consolidations, and diversions.

Diversions - Movement of cargo to a facility not in the manifesting responsibility of MOTBA.

Expected Receipt Listing - Computer printout which lists TCMD information for each CARDPAC. Produced at the same time as the CARDPAC.

Inventory, computer - Record created in the SURS files on submission of the receipt card.

Inventory, physical - Inventory of cargo actually located on the warehouse floor.

Job Bag - Envelope containing source documents, CARDPACS, ERL, and MOTBA Form 39A prepared by CDD at time of pre-lodge and sent to CFD to await arrival of truck or railcar.

Lift - Loading of cargo aboard a vessel.

Load Sheet (MOTBA Form 18) - Listing, by TCN and pieces, prepared by stuffing contractor or CFD for each truck-load of shipments transferred or diverted from the warehouses.

MOTBA Form 39A - Form requesting production of the CARDPAC. May be placed in job bag by CDD to be filled in by receiving checker when information on source documents is inadequate. Also prepared by stuffing contractor to request CARDPAC for undocumented shipments. Used to represent the source document for telephone prelodge

(i.e., information on enroute cargo received via telecon with the delivering driver).

MOTBA Receipt Stamp - Stamp placed on back of source documents for each shipment which has been prelodged.

Signed by checker acknowledging piece count and condition of cargo received.

Segment - A shipment or part of a shipment if the shipment was split.

Source Documents - The four documents, listed below, which are commonly used to account for cargo shipments.

1. GBL - Government Bill of Lading.
2. CBL - Commercial Bill of Lading.
3. Dray Tag.
4. TCMD - Transportation Control and Movement Document.

Stuffing - To load cargo into shipping containers.

Transfer - Intra-facility movement of cargo. MOTBA accountable for shipment movement.

TABLE OF SYMBOLS AND ABBREVIATIONS

| | |
|-----------|---|
| ADBL | - Average days between lifts. |
| BBPV | - Break-bulk point volume. |
| CDD | - Cargo Documentation Division, MOTBA. |
| CFD | - Container Freight Division, MOTBA. |
| CFS | - Container Freight Station, MOTBA. |
| CV | - Consignee volume. |
| ERL | - Expected Receipt Listing. |
| F | - "F" Value. |
| MOTBA | - Marine Ocean Terminal, Bay Area. |
| No. Ship. | - The number of shipments received by a consignee. |
| POD | - Port of Debarkation |
| POE | - Port of Embarkation |
| R | - Regression coefficient of correlation. |
| R^2 | - Regression coefficient of determination. |
| SCP | - Single Consignee Proportion. |
| SE-DPV | - Standard error of dependent variable (sometimes called the standard error of estimate). |
| SERC | - Standard error of the regression coefficient(s). |
| SU | - Shipment unit. |
| t | - Average age of cargo at stuff. |
| TCN | - Transportation Control Number. |
| TVSCC | - Total volume of cargo received in single consignee containers. |
| u | - Cube utilization of cargo containers. |
| WAMTMTS | - Western Area, Military Traffic Management and Terminal Service. |

I. INTRODUCTION

For years the War Department and then the Department of Defense has made extensive use of the high seas for the rapid, inexpensive, and relatively secure transportation of the supplies and equipment necessary to maintain the overseas defense installations of the United States. As the American presence abroad has intensified in the twentieth century, so have the problems associated with the transportation of these vital materials.

The maritime shipping industry, upon whom the Department of Defense relies heavily for the movement of its cargo, has experienced many changes in its methods of operation. As the shipping industry has adopted the containerization concept, DOD has been forced to comply with the modus operandi of using containerization for a high percentage of its export cargo rather than break-bulk shipment in order to achieve the objectives of low cost, high volume shipping.

The problems faced by the Defense Department during the transition to containerization are complex and difficult to grasp because of the numerous and varied elements involved. To maximize the cost-benefits in containerized shipping, it is essential that the Department of Defense examine all aspects of the containerized transportation problem. The element of the system isolated for study in this work is the container stuffing station operation at MOTBA.

There are many performance measures that could be considered when examining an operation as complex and diverse as the containerized stuffing operation. One factor, because of its importance in influencing the overall time delay in shipping from consignor to consignee, is considered essential to the maintenance of the desired shipping objectives. This factor is the age of cargo at stuff and it is examined by various data analysis techniques in order to ascertain what, if any, relationships exist between it and the other relevant factors that influence the containerized export cargo transportation system's performance.

This thesis is concerned with one aspect of the shipping problem faced by DOD. That is, the thesis attempts to answer the following questions: 1) can one quantitatively evaluate the performance of the system given the raw data that is derived from actual operations at the stuffing station, and 2) given the system as it presently exists, what influences the age of cargo at stuff.

In arriving at answers to these two pertinent questions, three phases of data analysis were utilized: the distribution audit for the dissection and examination of raw data, the variation analysis to analyze the variations experienced by certain variables, and the regression analysis to determine which of the variables influenced the age of cargo at stuff. The latter two used for inputs the outputs of a simulation model which through use of a modular concept and various routines allowed for the emulation of the container stuffing station operation.

In conducting the distribution audit, raw data, which contained information on approximately 44,000 shipments, was extracted from a four month operating period at the Container Stuffing Station, MOTBA, and systematically dissected by six computer programs into basic components that could be isolated for further examination. This audit identified important characteristics, e.g., volume, weight, density, and number of shipments, on both a consignee and POD basis, of the cargo moving through the stuffing station.

The variation analysis of variables was concerned with the range of values calculated by the computer program for the important variables which relate to the containerized stuffing operation, viz., the average age of cargo at stuff, the average cube utilization of the cargo containers, and the single consignee proportion. The variation analysis was conducted on thirteen major PODs. By utilizing the simulation model and using six repetitions of the four months of data, information was generated which delineated results for twenty-four thirty-day increments as well as the entire two year time span.

The regression analyses were conducted using the average age of cargo at stuff as the dependent variable. A number of analyses were performed on various sizes or groups of consignees. In producing a fit, the regression model utilized some of the following independent variables. They were: the proportion, by volume, of the total POD cargo going to a single consignee; the consignee volume; the number

of shipments going to a consignee; the total volume in single consignee vans; the single consignee van proportion; the break-bulk point volume; the average days between lifts; and several transformations of these variables.

To appreciate the overall concept of containerization, including its background and inception, as well as the MOTBA facility at Oakland, California, from where the raw data used throughout the thesis work was generated, it was deemed essential that such information should be included in the thesis. Chapter II is the vehicle used to convey this general information.

The nature of the problem which the thesis answers is contained in Chapter III along with the identification and subsequent definition of the various performance measures examined.

The three phases, including the computer program that were used to conduct them, are discussed in detail in Chapter IV. The actual programs are found in the back of the thesis in a separate appendix.

Chapter V is concerned with the explanation of the results of these three phases. The discussion includes the use of tables found in Appendix A as well as samples of the computer outputs of the various programs. These sample computer outputs are found in a separate section immediately preceding the Computer Program Section.

Chapter VI is used to evaluate the three phases as to their relevance and significance. It also is used to discuss

the validation, as well as the important advantages, of the simulation model.

The concluding chapter, Chapter VII, is a brief summary that highlights the results obtained by the utilization of the three phases of the data analysis techniques. It also contains a short explanation of the possible importance of these results to those most concerned with the performance of the container stuffing station, the monitoring element at MOTBA, whose task it is to oversee the activity of the contractor, and the individual consignee, whose livelihood is dependent upon the containerized export cargo transportation system.

II. BACKGROUND

A. HISTORY OF CONTAINERS

The term "containerization" is a static one and denotes nothing more than the use of a container into which something is put. This particular concept of packaging is not new; containers are as old as man. And yet, containers are as new as today, holding men and products as they cross a continent, circle the world, or penetrate the vast reaches of outer space. Some serve sophisticated, specific purposes; some have a multiplicity of general uses, yet each has its own unique efficiency.

The significance of the term "containerization" has changed greatly since the turn of the century. In the years following World War II it was realized that improved handling of general cargo in and out and within the ship was an economic necessity. Consequently, during the decade of the 1950's a great deal of money and effort was spent in research of the problem. Thorough detailed studies were made of existing methods of handling break-bulk cargo, palletization, forklift operation, improved cargo gear, hatch configuration, containers, etc. This research clearly demonstrated the costlines of existing cargo-handling methods and pointed to various means by which improvements could be effected.

B. CONTAINERS AND THE SHIPPING INDUSTRY

No single component of the transportation complex has been more affected by nor more responsive to the container concept than the steamship industry. The principal American-flag operators and many of their foreign-flag competitors have invested heavily of their corporate funds to obtain the specialized ships, the terminals, the road equipment, and the containers themselves, which this far-reaching program requires.

Perhaps the most exciting challenge which containerization offers is to the 'status quo' by which old line methods and old line thinking must give way before the new concept. New laws, new documentation, new interline agreements and new handling methods are being devised every day. The emphasis on intermodularity requires that management eliminate parochial thinking at every level of the transportation industry.

Improved efficiency in cargo handling, more economical terminal handling, reduced requirements for terminal facilities, and improved protection for cargo against weather, damage, and pilferage are made possible by the development of container usage. Additionally, interchangeability between modes of transportation and improved utilization of equipment are benefits made possible by the inception of containerization. The use of containers is the key to a whole new era in transportation in general and the shipping industry in particular.

C. THE INCEPTION OF CONTAINERIZATION

Modern containerization and the major breakaway from conventional cargo-handling systems in the maritime shipping industry dates from 1957 when Pan Atlantic Steamship Company, a forerunner of the present Sea-Land Service, Inc., installed container cells in the hold of the first of six conventional cargo ships and installed special-purpose cranes aboard ships to load and unload eight-foot square, thirty-five feet long, twenty-five long ton containers. The containers were built with extra structural reinforcing to permit them to be stacked four high in the ship, and to be lifted at the four corners by a lifting device that was attached to the crane. New devices were developed to connect and lash the containers on deck for the sea voyage. The gantry crane and its lifting device were built with the ability to place a container into any cell and to reach over the side of the ship to load and unload highway trailers on the quay. Each item of equipment was compatible with the other to form an integrated system. The first system was self-contained and could only expand through extension of its own facilities and not through the use of others in a normal cargo interchange.

Early in 1959, Matson Navigation Company, serving Hawaii from the West Coast of the United States, inaugurated a major container operation also using equipment especially designed for handling containerized cargo. At the same time Matson moved to containerization, Grace Lines converted two

ships to cellular design to transport containers from the East Coast of the United States to South America.

Containerization is the technical outgrowth of the understanding that all forms of transportation have the same common purpose of moving cargo in the most efficient, expeditious and safe manner. The use of containers compels closer integration of the multi-mode transportation system, and a more integrated system that will best serve the public and the transportation industry.

D. CONTAINERIZATION AND THE DEPARTMENT OF DEFENSE

Commercial containerships have become the primary means for transporting United States Department of Defense (DOD) general ocean cargo in recent years. Many millions of dollars have been saved by the utilization of containers and containerships vis-a-vis the use of traditional break-bulk cargo ships. As with their commercial counterparts, containerization has created some new operational problems for the DOD transportation managers responsible for the general ocean cargo destined for ports of debarkation (POD) and the individual overseas commands that they serve around the world.

The segment of the DOD transportation system which was examined in this thesis research has the structure depicted in Figure 1. Overseas commands, known as consignees, place orders with various vendors, referred to as consignors, for the purchase of items which are needed to carry out their

mission. Thus a requirement for transportation of these items from the consignor to the consignee exists.

There are two general categories into which the cargo can fall as it leaves the consignor enroute to the consignee: containerizable or break-bulk. Break-bulk cargo is sent directly to the POE where it is loaded aboard conventional cargo ships for the ocean voyage. If the material to be transported is containerizable and ordered in large enough quantities by the consignee, ocean shipping containers might be source stuffed, that is, the cargo will be placed into containers at the consignor's warehouse, sealed and shipped directly to a port of embarkation (POE) for lift aboard a container ship for ocean transport to the consignee. Smaller quantities of containerizable cargo are shipped from the consignors to container stuffing stations where cargo for particular PODs or consignees is collected and stuffed into containers after certain minimum volume or maximum weight restrictions have been met. These stuffing stations may be located near the port facilities or many miles inland. Again, as with the source stuffed containers, after loading is completed, the containers are transferred to a commercial shipping company for lift aboard container ships.

Containerized cargo arriving at the port of debarkation is handled in one of two ways. Containers that have cargo for only one consignee, i.e., single consignee containers, are off loaded and sent directly to the consignee; containers

holding cargo for more than one consignee are routed to break-bulk stations (BBS) that service the particular consignee and the containers are unstuffed. The cargo is then segregated by consignee for further shipment to the individual overseas commands.

E. WESTERN AREA, MILITARY TRAFFIC MANAGEMENT AND TERMINAL SERVICE

Export cargo sponsored by the Department of Defense or other government agencies destined for overseas commands falls under the cognizance of Western Area, Military Traffic Management and Terminal Service (WAMTMTS). Western Area, Military Traffic Management and Terminal Service is a jointly-staffed field organization under Headquarters, Military Traffic Management and Terminal Service (MTMTS), Washington, D. C., which in turn is a major field command of the Department of the Army, under the Secretary of the Army. WAMTMTS was established on 15 February 1965 at the Oakland Army Base, Oakland, California, and is staffed by military personnel of the three services and civil service employees.

The mission of WAMTMTS is: (1) to command assigned installations and activities; (2) provide for area-wide implementation of MTMTS Single Manager responsibilities for traffic management, ocean terminal operations and related transportation services involved in the movement and transshipment within and through CONUS of cargo sponsored by the Department of Defense and other government agencies; (3)

develop and maintain plans for operational readiness under mobilization, emergency, or special contingencies; (4) train related military units, military personnel, and civilians as assigned; and (5) provide administrative and logistic support to tenant and satellite agencies.

WAMTMTS is responsible for transportation management of domestic and export shipments in the fourteen (14) western states of Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington, Colorado, Nebraska, New Mexico, South Dakota, North Dakota, and Wyoming. All export cargo destined for shipment to installations within the Pacific Area is routed to one of the three Military Ocean Terminals operated by WAMTMTS on the West Coast. Military Terminal Unit, Pacific Northwest, Seattle, Washington (PNW) handles export cargo for Puget Sound while Military Ocean Terminal, Bay Area, Oakland, California (MOTBA) controls the export cargo for San Francisco Bay and Northern California while Southern California Outport, Long Beach, California (SCO) is charged with responsibility for export cargo departing CONUS from the Southern California area. In addition to these three ocean terminals, WAMTMTS operates the Military Airlift Clearance Authority (MACA) Agency which is the single air clearance authority for control of military cargo into the nine (9) U.S. aerial ports of embarkation for worldwide airlift. Except for special emergency shipments, it directs the flow of all air cargo in the Military Airlift Command's transportation system.

F. MILITARY OCEAN TERMINAL, BAY AREA

Military Ocean Terminal, Bay Area (MOTBA) is by far the largest operating element of WAMTMTS. It was originally established on 1 July 1964 by DOD to consolidate the terminal facilities of the Army and Navy in the San Francisco Bay Area. MOTBA operates the large cargo terminal facilities at the Oakland Army Base and the Alameda Reefer Facility. Between the two installations, it controls seven (7) deep water berths in addition to an 84 acre tidewater container stuffing area located on the Oakland Army Base. The ports of Stockton, Sacramento, and Eureka also fall under MOTBA's control.

The two general classifications of export cargo that are received by MOTBA are break-bulk cargo, that which cannot be containerized because of its size or weight and containerizable cargo which can be placed in containers for shipment aboard commercial container ships.

G TIDEWATER CONTAINER STUFFING STATION

The Container Stuffing Station (CSS) operates under the Container Freight Division (CFD) at MOTBA and is referred to as a tidewater station to distinguish it from an inland stuffing station. The operations conducted at both installations are similar in that containerizable cargo is loaded into the ocean shipping containers that are then transferred to commercial shipping companies for overseas shipment aboard one of their container vessels.

The CSS is operated for MOTBA by a civilian contractor under a contractual arrangement. The cargo received by MOTBA that can be containerized is routed to the large warehouses that comprise the bulk of the CSS's operation. Here the cargo is loaded into containers for shipment to the various ports of debarkation overseas. Various restrictions are placed upon the contractor as to how the vans are to be loaded. Governmental cube utilization standards, cargo mix restrictions, and various individual POD and consignee stipulations are only a few examples of the constraints under which the contractor is obligated to work.

As a general practice, the cargo remains in the warehouses until shipping vans can be obtained from the commercial shipping company that will transport the cargo overseas. Some military vans are used, but most of the cargo is transported in commercial containers. These commercial and military shipping containers range in approximate size from the small 8x8x20 foot vans with volumes in the neighborhood of 1100 cubic feet and weight capacities around 40,000 pounds to the large 8x8x40 foot containers which have volumes in the 2,400 cubic foot range and weight capacities of around 46,000 pounds. The size, volume, and weight restrictions vary from commercial carrier to commercial carrier and in general the container ships are designed so that they are only capable of carrying the company's containers. Figure 2 delineates the sixteen (16) container types presently in use.

III. NATURE OF CONTAINER STUFFING OPERATIONS AND STUDY OBJECTIVES

A. CARGO FLOW AND CONTROL

Western Area, Military Traffic Management and Terminal Service has management responsibility for controlling the flow of export cargo to overseas commands while it is within the continental United States. To aid in accomplishing this mission, WAMTMTS has two management information systems, both of which utilize a Burroughs 5500 computer: The Mechanized Export Traffic System (METS) and the Surface Export Cargo System (SURS).

1. Mechanized Export Traffic System

METS monitors the flow of cargo within CONUS. It is the offering/releasing system which WAMTMTS utilizes to control and monitor the flow of DOD cargo from consignor to stateside port of embarkation (POE), i.e., one of the three ocean terminals under WAMTMTS's control. The basic input to the system comes from the consignor, viz., a commercial vendor or a military depot, and includes shipment data, means of transportation, destination, etc., on a particular shipment. Since these individual consignors are under no control from WAMTMTS, the data received is oftentimes improperly formatted thereby causing the generation of documentation errors which require purging by manual methods.

2. Surface Export Cargo System

SURS, also referred to as SURS/CARDPAC, is tasked with the accounting for export cargo once it is within the confinement of one of the three west coast ocean terminals. CARDPAC refers to a package of eight (8) IBM cards which are prepunched by terminal personnel from data supplied by METS plus any additional information extracted from shipping forms, which is obtained during prelodge of the shipment by delivery truck drivers or employees of shipping companies.

The CARDPAC, which has a variety of data coded on it, together with the Expected Receipt List (ERL), a list of the cargo expected in a particular vehicle, form the "Job Bag". The "Job Bag" along with the applicable source document, e.g., Government Bill of Lading (GBL), Commercial Bill of Lading (CBL), Dray Tag, or Transportation Control and Movement Document (TCMD) are forwarded to the cargo receiving area of the terminal. There the checker inspects the cargo as it is unloaded and corrects the CARDPAC if necessary. If corrections are required, processing is delayed until correct information is obtained; otherwise, the CARDPAC is attached to the shipment immediately. In either case, the CARDPAC is ultimately utilized to monitor the flow of that particular shipment throughout its many movements within the terminal facilities:

In summary, the two systems, with a compatible interface, work in unison providing WAMTMTS with a monitoring

capability. Unfortunately, problems have arisen with both of the systems involved and with the top management reports which these systems help to generate. These problems have made the mission of WAMTMTS more difficult.

B. GENERAL DESCRIPTION OF PROCEDURES

Many different factors could have been analyzed at a facility like MOTBA, Oakland. A cursory look at the amount of data generated during an actual operational period like the four months under consideration in this thesis reflects the volume and diversity of the export cargo traffic handled. However, the specific problem to be discussed in this thesis is that of determining by means of a combination of statistical and analytical techniques how the average age of cargo at stuff (t) is influenced by the various relationships/interrelationships it enjoys with the other variables involved in the container stuffing operation.

In short, the problem that had to be dealt with was how to most effectively and efficiently take raw data from the operation specified and systematically and clinically summarize it in order to ascertain meaningful, productive conclusions.

Three separate and distinctly different phases were employed to achieve the objective. These were: a distribution audit, an analysis of variation in performance variables, and an investigation of factors related to consignee cargo aging.

A logical flow of analytical-oriented work generally proceeds from a broad, general spectrum to a well-defined, more exacting one. In this thesis, that same format was used. In the first phase, the distribution audit, raw data was taken from a four-month actual operational period at the container stuffing station and systematically dissected by six computer programs into basic components that could be isolated and more easily analyzed. This audit identified important characteristics, e.g., volume, weight, density, number of shipments, etc., of cargo moving through the stuffing station.

The second phase utilized the simulation model to determine variations in the average age of cargo at stuff, the average cube utilization, and the single consignee van proportion for thirteen major PODs. The simulation model provided data for individual PODs for twenty-four thirty-day increments, a two year span.

The simulation model was employed to measure the variations that exists among important variables, viz., average age of cargo at stuff, cube utilization, and single consignee proportion. This is considered essential to MOTBA as contractual agreements are based upon these variables and other factors which evaluate a contractor's performance and aid MOTBA in performing a sound monitoring program.

The third and final phase was accomplished by the implementation of regression analyses which utilized simulation output data for measuring factors that influence cargo aging.

It should be emphasized at this point that the basic data employed throughout the thesis was gleaned from actual operations at the container stuffing station and pertained only to containerizable cargo. Hence, no effort was made to ascertain information about, or use data concerning, break-bulk operations.

C. DEFINITIONS OF TERMS AND VARIABLES

Numerous factors and variables are analyzed in this thesis. Major variables and terms are defined in the following paragraphs to avoid ambiguity.

1. Age of Cargo at Stuff.

This factor is the duration of time (in days) between a shipment's arrival at the stuffing station and its being stuffed in an assigned container. The figure is computed on a shipment basis.

2. Average Age of Cargo at Stuff

This factor is likewise computed on a shipment basis, but at the same time it can be computed either on a POD or consignee basis. It is the total age of all shipments being sent to a POD or consignee divided by the number of shipments. Utilizing the shipment as the unit of computation, vis-a-vis a unit of volume or weight, better reflects to the individual PODs or consignees, the users of the system, the delays which accrue to complete shipments. Shipments may be divided or "split" into segments while being loaded into the containers in order to stay within the volume or weight limitations of the container. It should be noted

that those shipments with several segments are assigned an age equal to the age of the last segment to be stuffed.

3. Single Consignee Proportion

This measure is the proportion of the cargo volume which is moved in containers that are stuffed with goods for only one (1) consignee. Volume was used as the unit of calculation in the thesis because it showed the quantity of volume that does not have to be shipped to, and handled by intermediate break-bulk stations. Calculation of the single consignee proportion is accomplished by dividing the volume of cargo (measured in cubic feet) in single consignee vans by the total volume of cargo that is received by the particular POD or consignee.

4. Cube Utilization

This is the volume proportion of the individual container that is displaced by cargo. This measure is calculated by dividing the volume of cargo by the total displaceable volume of the container.

5. Average Cube Utilization

This figure is computed by dividing the total volume of cargo by the total available space in the containers used to transport cargo to the POD during the time frame under consideration. However, mixed containers, those with cargo for more than one consignee, require some deliberation. In this case, assignment of the cube utilization is made to each consignee based upon their percent usage (by volume) of the container.

6. Water Commodity Code

Eleven (11) number intervals which categorize the cargo. Table VII, Appendix A, delineates the individual intervals and their meaning.

7. Type of Cargo Code

Twenty-two (22) codes for categorizing the cargo. Table VI, Appendix A, provides a detailed listing of the alphabetical codes and their specific meaning. These codes are utilized to establish mixing of cargo restrictions, and are sometimes referred to as exception handling codes.

8. Days Between Lifts

The period of time, in days, that transpires between the successive departures of vessels servicing a particular POD.

9. Average Days Between Lifts (ADBL)

The average length of time that accrues from the departure of one vessel to the departure of the next vessel destined for a POD. It is calculated by dividing the number of days in the period under consideration by the number of such defined departures.

IV. DATA ANALYSIS PROCEDURES

A. DISTRIBUTION AUDIT

Raw data was taken from computer tapes supplied by MOTBA for the 123 day operating period from 1 July to 31 October 1973. This data contained information on 43,984 shipments received at MOTBA's Container Stuffing Station during the period under consideration. The information available for each shipment, with some items in coded format, included the POD, consignee, type of cargo code, volume, weight, number of pieces, receipt data in serial form from 1 to 123, water commodity code, and the transportation accounting code. A computer program selected this raw data from the MOTBA tapes and placed it in alphabetical order by POD and consignee in a data file. Table III, Appendix A, depicts an example of how the data was arranged. Various segments of the data in this form were then used in the additional computer work described below. Table IV, Appendix A, shows a summary of raw data that was compiled as a result of the operations at MOTBA's CSS during the 123-day period. It should be noted that although 110 PODs and 1822 consignees were identified as having received shipments during this period, some erroneous data may have been present due to key punching errors at the terminal. For this thesis work, the observed data was assumed to be correct and subsequent calculations were based on the given information.

During the course of the distribution audit, six computer programs were written to tabulate essential data. Table V, Appendix A, delineates the pieces of information generated by these six programs; they are explained below.

The first program (Computer Program One) was written to determine the number of shipments, the total volume, the average volume, the standard deviation of the volume, the total weight, the average weight, the standard deviation of the weight, the average density and the standard deviation of the density by individual consignee. Also, the program established the intervals of volume, weight, and density into which each of the 43,984 shipments fell.

The second program (Computer Program Two) provided an identical output to that of the first except that with this program the information was generated for the POD vis-a-vis the consignee.

The third program (Computer Program Three) delineated the number of shipments as well as the total volume and weight that arrived at the Container Stuffing Station for each of the 123 days under consideration. As might be expected a very small amount (less than one percent) of the shipments arrived at the stuffing station on the thirty-five (35) weekend days and four (4) holidays that occurred during the four-month period. Tables VI and VII, Appendix A, show a summary of the Container Stuffing Station's activity for the period.

The fourth program (Computer Program Four) was designed to illustrate the diversity of the shipments that went to each consignee by examining the type of cargo codes assigned. The number of shipments within any one of 26 categories was listed on the computer output. Although only eighteen (18) of the twenty-six (26) codes are actually assigned at this time, the computer program was written in a general manner to accept future additions to the list. Table VIII, Appendix A, gives a listing of the cargo codes along with a brief description of what they mean.

The fifth program (Computer Program Five) was similar to the fourth program both in design and content. In this program the diversity of the shipments was displayed by water commodity codes which are delineated in Table IX, Appendix A.

The sixth program (Computer Program Six) was formulated with the purpose of providing a table showing the daily activity by consignee — of the volume, weight, and density of shipments — received at the stuffing station. This result illuminated the wide dispersions in activity among the consignees. It also provided the mechanism whereby a ranking could be established for the individual consignees based upon the daily activity.

B. CONTAINER STUFFING PERFORMANCE VARIATION ANALYSIS

A container stuffing simulation model, developed by Dr. James P. Hynes, Assistant Professor, Department of Operations Research and Administrative Sciences, Naval Postgraduate

School, Monterey, California, simulated operations at MOTBA's Container Stuffing Station and generated data for this analysis as well as the third and final phase of the data analysis procedures. The cargo data input to the model was that supplied by MOTBA for the 123 day period from July through October of 1973.

The second phase of this analysis was the examination of the variation in the performance variables. In this phase, output generated by the simulation model was utilized to ascertain important data about the containerized export cargo transportation system. During this part of the analysis, only thirteen major PODs were examined.

There were fourteen (14) pieces of information generated by the simulation model that were retrieved and manipulated by the utilization of a computer program. Computer Program Seven accomplished this task. The following data was available for each container loaded: record identification, the current day (from 1 to 738), the POD (coded from 1 to 13), the container type (coded from 1 to 16), volume loaded in the container (in cubic feet), the cube utilization (percent), the weight loaded in the container (in hundred weight), the weight utilization (percent), the serial number assigned to the container (the number being either positive or negative to indicate a single consignee van or mixed van respectively), the stuffing list identification number, the number of consignees whose shipments were loaded into the van, the number of dated shipment segments (only the last

segment of a shipment stuffed is dated), and the total age of these dated shipment segments.

Since the simulation model was instrumental in this and the final phase, a brief discussion of its principles and functions is considered imperative at this point in order to clarify its capabilities and elaborate on its methodology.

1. The Simulation Model

Space and time restrictions prohibit a complete description of the simulation model and all of the assumptions that were made. Thus, only the important features of the model are discussed. For complete documentation of the model see reference 16.

The simulation model replicates the major factors influencing waterfront operations at the container stuffing station. This includes variations in vessel departures, shipment inputs, booking containers aboard vessels, and stuffing restrictions.

The program is divided into modules; the modules and their interrelationships with the data files and information stacks are depicted in Figure 2, Appendix B. Shipment arrivals, volumes, and weights are fed into the program on a daily basis and stored. Information on future vessel arrivals, container types, and container availability are also fed into the computer program. The booking routine begins reserving containers aboard vessels according to accumulated cargo volumes and forecasted POD volume inputs. Several days before a vessel's arrival, the container stuffing

routine begins cargo stuffing into the containers that can be loaded into the reserved spaces on the vessel. Containers are drawn from the empty container pool which is replenished by the container dispatch routine, which is keyed to the containers booked on arriving vessels. The container lift routine transfers stuffed containers on to the arriving vessels.

a. The Stuffing Routine

The stuffing algorithm was formulated to include the following factors:

1. Maximum usable volume for cargo in each type of container.
2. Maximum cargo weight for each type of container.
3. Minimum load requirements in terms of the minimum volume of cargo that must be on hand before cargo stuffing into the container can begin.
4. Consignee mixing restrictions in terms of which consignee cargos (if any) can be mixed when necessary.
5. Minimum shipment splitting restrictions in terms of the minimum allowable size to which shipments can be split when necessary for stuffing.
6. The stuffing procedure is vessel oriented vis-a-vis cargo oriented. In short, the

procedure used here initiates stuffing activities to meet vessel arrivals/departures, whereas a cargo oriented one would initiate stuffing activities solely on the basis of cargo accumulations.

Stuffing procedures are governed by two factors: the minimum load requirement and the stuffing list. For this simulation the minimum load requirement was set at 50% of container volume. The stuffing lists are inputs to the simulation program which define the sequence in which the stuffing routine attempts to load cargo into containers, and at the same time also specifies which consignee cargos can be mixed. For this simulation no consignees were forced to take only single consignee containers, but every effort was made to stuff single consignee vans before mixing cargo. For each POD, there are a set of stuffing lists, which delineate the combinations of consignees where cargos can be mixed in a single container. The placement of consignees on a list, and the order in which each list is sequenced as input data controls how cargo will be stuffed by the routine. Also, each stuffing list specifies an adjustment factor which is used in conjunction with the breakeven point to determine the minimum load requirement. The stuffing list inputs to the simulation program provide the ability to influence the proportion of containers which are loaded with single consignee cargo, the level to which containers must be filled before being closed out, and the various ways in which consignee cargos can be mingled.

The minimum load requirement controls the initiation of cargo stuffing into a container. Specifically, it represents the volume of cargo that must be available for the consignees on a stuffing list before the algorithm will implement the stuffing list to load cargo into the container. The minimum load requirement value is determined by taking the breakeven volume of the container at hand and multiplying it by the breakeven adjustment factor on the stuffing list being used. The breakeven volume is the minimum economically acceptable cargo volume that must be stuffed into a container before it can be closed out and is derived from a comparison with non-containerized ocean shipping costs. It is a self-imposed military restriction. For most PODs in the Pacific, the breakeven volume is roughly fifty percent of the container volume.

2. Obtaining Realistic Results

In order to obtain realistic results, the simulation model was used to simulate operations at MOTBA's Container Stuffing Station for approximately a two year period (738 days). The actual shipment data that was available for the 123 day period was repeated six consecutive times in the model to cover this time frame. However, the routines that govern the functioning of the model were supplied with data that had a different time base. For example, the ship schedule routine has a base of 200 days which meant that different ship arrivals, different container reservations, and different container types would be available for each

repetition of the 123 day stuffing cycle. Thus, any unusual evolutions that occurred during one period would not be repeated in the next, providing results that were not dependent upon input sequences.

C. REGRESSION MODEL

The final analysis was a regression model. The objective was to measure relationships between the several concomitant variables and the dependent variable which is defined as the average age of a consignee's cargo at stuff.

As mentioned in the preceding section, input for the regression phase of the data analysis procedures was generated by the simulation model. These inputs, which comprised the seven independent variables plus the dependent variable, were: the proportion, in percent, of the volume of the POD going to an individual consignee; the volume, in cubic feet, going to an individual consignee; the total number of shipments being sent to a consignee; the average age of a consignee's cargo at stuff; the total volume shipped in single consignee vans to a consignee; the proportion, in percent, of cargo going to a consignee in a single consignee vans; the volume, in cubic feet, going to the break-bulk station serving a consignee; and the average days between lifts for a particular POD.

The implementation of the regression model utilized 556 consignees which are served by the thirteen major PODs. The consignees were arbitrarily divided into small-, medium-,

and large-volume categories and finally mixed in a group of 400 in order that the regression model could be employed to determine interrelationships among variables for various types of consignees.

In summary, three phases were utilized in the overall data analysis procedures. Firstly, the raw shipment data was reduced and summarized in the distribution audit which employed six computer programs. Secondly, an analysis of the variation of certain performance variables was conducted for thirteen major PODs by utilizing another computer program which used the output generated by the simulation model. Finally, a regression model, whose inputs had also been generated by the simulation model, was developed, and the results analyzed through a series of step-wise linear regressions using the SNAP/IEDA statistical package to establish relationships among the variables and to determine the degree of correlation between each of them.

V. PRESENTATION OF RESULTS

This chapter draws together for display and explanation the empirical findings of the analysis procedures described in Chapter III. Computer Outputs One-1 through Eight are enclosed to help the reader visualize the output format and represent only a sample of the computer printout for the various segments of the programs discussed below.

The seven computer programs used in this thesis were programmed in FORTRAN IV for the IBM-360 computer. Complete computer outputs are in the custody of Professor James P. Hynes at the Naval Postgraduate School, Monterey, California.

A. DISTRIBUTION AUDIT PHASE

1. Computer Program One

The first program, which was done on a consignee basis, had for an output (Computer Output One-1,-2,-3,-4) four separate types of information. The first three sections of output delineate in interval format the number of shipments that are described by each of the various intervals of volume, weight, and density respectively for each of the 1822 consignees during the four-month time frame.

The fourth and final segment of the output shows in tabular form the computation of total volume and weight and the average and standard deviation for all three quantities, viz., volume, weight, and density.

A look at the output, therefore, gives an insight into the range of activity for each consignee. Many consignees receive an infinitesimally small part of the total shipments, while others receive thousands of cubic feet of volume and hundreds of thousands of pounds in weight. A detailed look at the density (weight/volume) figures also shows some disparity. While the average density for most consignees hovers in the area of 20-25 lbs./cu.ft., a few do receive extremely dense shipments.

A closer look at the printout revealed that 783 consignees (43%) received only one shipment during the four month period. Moreover, 1448 consignees received less than ten shipments, meaning that approximately four-fifths (79.8%) fell into this category. Finally, only 8 received over 1000 shipments during the same time frame. The program further showed that 40 of the 1822 consignees (2.2%) contributed 60% of the total activity during the period under consideration.

| Number of Shipments | 1 | 2-9 | 10-99 | 100-999 | over 1000 |
|----------------------|------|------|-------|---------|-----------|
| Number of Consignees | 783 | 665 | 303 | 63 | 8 |
| Percentage | 43.0 | 36.5 | 16.6 | 3.5 | 0.4 |

2. Computer Program Two

The second program output (Computer Output Two-1,-2,-3,-4) follows the exact format of the first except that it is calculated on a POD basis. The breakdown here is to illustrate the wide disparity in activity among the 110 PODs. Once again the range is great with a small number of PODs

providing most of the activity. As Table X, Appendix A, illustrates the thirteen major PODs, which comprise slightly more than 10% of all PODs, contribute approximately 80% of the activity.

Inspection of the computer printout showed that 29 of the PODs (26.4%) received only one shipment during the four month period while 59 of the PODs (53.6%) were recipients of less than 10 shipments. Of the remaining 51 PODs, 23 (20.9%) received between 10 and 100 shipments, 15 (13.6%) received between 100 and 1000 shipments, 8 (7.3%) received between 1000 and 2500 shipments, while 5 (4.5%) received more than 2500 shipments.

| | | | | | | |
|---------------------|------|------|-------|---------|-----------|-----------|
| Number of Shipments | 1 | 2-9 | 10-99 | 100-999 | 1000-2500 | over 2500 |
| Number of PODs | 29 | 30 | 23 | 15 | 8 | 5 |
| Percentage | 26.4 | 27.3 | 20.9 | 13.6 | 7.3 | 4.5 |

3. Computer Program Three

The third program output (Computer Output Three) displays the amount of cargo in shipments, volume, and weight that arrived at container stuffing station for each of the 123 days under consideration. Table VI, Appendix A, is a tabular summary showing the total and range for shipments, volume, and weight for each of the days of the week plus the four holidays that occurred during the period. As might be expected, the weekend days plus the four holidays provided the least activity.

A declining trend could be discerned in the series of the seventeen (17) normal five-day work weeks. Table VII, Appendix A, shows a weekly breakdown for the activity at the container stuffing station.

4. Computer Program Four

The fourth program output (Computer Output Four) shows the number of shipments in each of the twenty-six types of cargo letter-coded categories. As can be seen by the sample of data presented, the preponderance of cargo is of type Z (general cargo). A complete analysis of the program printout revealed the information presented in the table below.

| | |
|--|--------|
| Number of Errors in Documentation (no code) | 1,324 |
| Percentage of Errors | 3.01 |
| Total Number of Z-Type Shipments | 36,533 |
| Percentage Z-Type Shipments | 83.06 |
| Number of Consignees Receiving No Z-Type Cargo | 167 |
| Percentage of Consignees Receiving no Z-Type Cargo | 9.17 |

5. Computer Program Five

The fifth program output (Computer Output Five) displays the number of shipments in each of the eleven water commodity number-coded categories. Once again the preponderance of all cargo, as illustrated by the sample of data presented, fell into the general cargo area. A complete breakdown is found in the following table.

| | |
|---|-----|
| Number of Errors in Documentation (no code) | 506 |
|---|-----|

| | |
|----------------------|------|
| Percentage of Errors | 1.15 |
|----------------------|------|

Total Number of Shipments by Type

| | | | |
|-------|---|--------|---|
| Chill | 6 | Freeze | 2 |
|-------|---|--------|---|

| | | | |
|------|---|-----|----|
| Bulk | 0 | POV | 24 |
|------|---|-----|----|

| | | | |
|---------|-----|----------|------|
| Baggage | 228 | HH Goods | 1141 |
|---------|-----|----------|------|

| | | | |
|------|-----|-----------|---|
| Ammo | 147 | Rad. Act. | 0 |
|------|-----|-----------|---|

| | | | |
|---------|-------|---------|----|
| General | 41918 | Special | 10 |
|---------|-------|---------|----|

| | |
|-----------|---|
| A/C Assd. | 2 |
|-----------|---|

| | |
|---------------------------------|------|
| Percentage of Cargo Not General | 3.56 |
|---------------------------------|------|

6. Computer Program Six

The sixth program output (Computer Output Six-1,-2) displays by intervals of volume and weight the number of days shipments arrived at the container stuffing station for a particular consignee. Also listed immediately under the number of shipments by interval is the percentage of days (N/123) for that type of shipment.

Once again, this program output illustrates the fact that, relatively speaking, very few consignees are really active users of the containerized export cargo transportation system. For example, in program six a printout was displayed to show activity at the container stuffing station by consignee. This printout showed that 84.7% of the consignees received shipments at the station only 10% of the time. At the other extreme only 38 (2.1%) of the consignees received shipments at the station more than 50% of the 123 days under

consideration. Thus, while the aggregate of 1822 consignees uses the container stuffing station, a relatively small number receive a very large percentage of the stuffing operation cargo. The following table displays a breakdown of the information gleaned from this computer printout as to the percentage of time that the various consignees had actual input activity at the container stuffing station.

| Activity Rate (Percent) | 0-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-100 |
|--------------------------|------|-------|-------|-------|-------|--------|
| Number of Consignees | 1544 | 135 | 49 | 40 | 16 | 38 |
| Percentage of Consignees | 84.7 | 7.4 | 2.7 | 2.2 | 0.9 | 2.1 |

B. PERFORMANCE VARIATION ANALYSIS PHASE

1. Computer Program Seven

The seventh program output (Computer Output Seven-1, -2, -3) was the result of the retrieval and subsequent manipulation of the data from the simulation model as delineated in Chapter III. The output was divided into two parts: the printout listing the activity of the thirteen (13) major PODs for each of the twenty-four (24) thirty day increments (Computer Output Seven-1, -2) and the summarized activity of the thirteen (13) PODs for the entire 720 day (approximately two years) span (Computer Output Seven-3).

Several key output items are listed in the printouts. Among these are: the number and type of containers received by the PODs, the average and standard deviation of the cube utilization of these containers by type; the single consignee proportion by container type; the average and standard

deviation of the age of cargo at stuff; and the number of single consignee containers by container type.

By comparison of these parameters from month to month, one can see quite readily the variation that was experienced by the different PODs. Tables XI, XII, and XIII, Appendix A, delineate this information for POD 1, 7, and 13 respectively. From these tables one can realize the wide range that does occur during the two year period.

For example, POD 1 has, for an average, 42 containers of type 10 sent to it per month, but the range is from 19 to 67 for the twenty-four month period. Moreover, POD 7 averaged 38 containers of type 8 per month, but in fact had zero (0) containers of that type one month and only two (2) another month. POD 7 also showed the greatest disparity in average age of cargo at stuff with a range in excess of 12 days. Furthermore, POD 13 had the largest disparity of the three PODs shown in the tables with regard to average cube utilization. Using container type 6, the average cube utilization varied from 69.583% to 87.000% or about 20% variation over the two year period under consideration. Thus, one is able to quickly ascertain that a wide variation does indeed exist in the significant performance variables that govern the operational performance at the container stuffing station.

C. REGRESSION ANALYSIS

With the eight variables listed in Chapter III, several regression analyses were performed using the SNAP/IEDA

Computer Package with its stepwise multiple regression routine in an effort to ascertain results that would help to explain the interrelationships among the seven independent variables and the dependent variable, the average age of cargo at stuff.

SNAP/IEDA produces a stepwise linear fit for the variables specified and prints the results out in tabular form with coefficients for each of the independent variables and the related calculations for each step in the regression. An R^2 value (M-R2), which is the square of the multiple correlation coefficient of the regression, along with the standard errors of the regression coefficients, and the standard error of the dependent variable (SE-DPV) are displayed for each step of the regression. SE-DPV is used to denote the standard error of the dependent variable after removing the effects of the independent variables in the regression, and SERC is used to denote the standard error of the regression coefficients for the particular regression step.

The 556 consignees were arbitrarily divided. The division was made using the basis of the individual consignee's percentage of total volume of the POD which served the consignee. The three categories were small-volume, medium-volume, and large-volume.

The small-volume consignees consisted of those with a volume percentage of less than .1%; the medium, .1%-.99%; and the large, 1% and greater. The large-volume category

was further subdivided into ten intervals and placed in a tabular format to better illustrate the wide range of activity enjoyed by the consignees in this category. Table XIV, Appendix A, delineates the number of consignees in each of these groupings. Furthermore, Table XV, Appendix A, displays another breakdown of the large-volume consignees by exhibiting the number of such consignees that are serviced by each of the thirteen PODs and the interval into which each of the individual consignees fall. For example, POD SA1 had thirteen (13) consignees in the large volume category and of those, eight (8) are in the 1% - 2% interval, two (2) in the 2% - 3% interval, two (2) in the 20% - 30% interval, and one (1) in the over 30% interval.

At this point, a study of the scatter plots of the independent variables versus the dependent variable suggested that a transformation of certain of the variables might improve the regression fit. A sample of the scatter plots is presented as Computer Output Eight. The consignee volume, number of consignee shipments, and the break-bulk point volume were all manipulated to form new variables by forming the following ratios: $1/CV$, $1/No. Ship.$, and $1/BBPV$.

Utilizing the various factors, equations were formulated and the significance of the regression coefficients was evaluated. In general, the following held true; for large-volume consignees, the average days between lifts (ADBL) factor was the most significant; for medium-volume, the single consignee van proportion; and for small-volume

consignees, the break-bulk point volume (BBPV). Table XVI, Appendix A, displays this data.

The reason for this can be explained intuitively. In the case of the large-volume consignees, the average days between lifts (ADBL) was the most significant single factor because it is this variable that represents the frequency of ship departures to the various PODs serving the consignees of the large-volume category. Obviously, the large-volume group will generally have sufficient numbers of shipments on hand for every ship departure. Having this amount of volume to ship will not necessitate the need, in most cases, for the shipments to be routed via a break-bulk station in a mixed van.

A different explanation must be used for the medium-volume group. For this grouping a higher than average single consignee proportion indicates the necessity of the consignee to receive single consignee vans because of break-bulk point conditions. Unlike the large-volume category, the medium-volume group frequently does not have enough shipments on hand when a ship arrives. It must depend upon other cargo going through the break-bulk point. However, if there is no other cargo going through the break-bulk point, then the cargo must accumulate and eventually move in single consignee vans at a considerable age. Hence, if due to mixing restrictions the cargo must move in single consignee vans, then average age of cargo at stuff (t) will be increased significantly as is illustrated by the positive sign

associated with the regression coefficient for the single consignee van proportion in Table XVI, Appendix A.

The small-volume consignee group has still another variable governing their average age of cargo at stuff. Much, if not all, of the shipments going to these consignees is shipped in mixed vans. Therefore, the break-bulk volume is of paramount importance to the small-volume consignees. For example, if the POD serving these consignees is very active and receives a lot of shipments by mixed vans, the average age of cargo at stuff will be effectively decreased as is illustrated by the aforementioned table. Likewise, if there is little activity at the break-bulk point (break-bulk volume is low), the age will tend to increase.

Two things should be noted about this phase of the regression analysis and the preceding explanation of results. Firstly, it is intuitively obvious that the average days between lifts will affect the average age of cargo at stuff for all consignees, no matter what category they are in. Secondly, the single consignee proportion indicates how mixing restrictions influence age of cargo at stuff after other effects have been removed.

Another step taken with the large-volume consignee group was a further sub-division in which the largest 52 consignees were separated from the original 136, and a separate regression analysis was performed on this group. These 52 consignees, which comprise less than 10% of the entire group, account for 57.2% of all shipments and 65.5%

of the total volume. The following pertinent data applies to this particular regression analysis.

| | | |
|-----------------------|--|-----------------|
| 52 Largest Consignees | $R^2 = 0.768$ | SE-DPV = 1.479 |
| Equation | $t = -11.009 + 0.329 (1/CV) + 15.481 (SCP) + 0.363 (ADBL)$ | |
| SERC | (0.044) | (3.289) (0.058) |

The regression equation that relates to the fifty-two (52) largest (by total volume) consignees shows that three values determine the average age of cargo at stuff (t) for this group. They are: 1/CV (the inverse of the consignee volume), the single consignee van proportion (SCP), and the average days between lifts (ADBL). All three are considered significant. What is interesting in this equation is that the single consignee proportion causes an increase (shown by the positive sign on the regression coefficient) in the average age of cargo at stuff. This result is similar to that for the medium-volume group discussed earlier. This result is explained by the fact that other regression data showed an inverse correlation between the break-bulk point volume and the single consignee proportion. Thus, if the break-bulk point volume is low it means that there are very few consignees served by that station with whom the large consignee could mix its shipments in mixed consignee vans. Therefore, the shipments must wait to go single consignee vans thereby raising the single consignee proportion value for the large consignee while at the same time adversely affecting (increasing) the average age of cargo at stuff as reflected by the aforementioned equation.

The other two factors are much more obvious. Once again the age is increased by an increase in the average days between lifts (ADBL). Also the age decreases as the amount of consignee volume increases. This certainly is plausible since the more volume a consignee has shipped to it the less delay there will be in meeting the minimum load requirements and, therefore, the quicker the large consignee will receive his containerized cargo.

Since the objective of the regression analysis work was to establish interrelationships for the entire group of consignees, further work had to be done. Examining the data that had been compiled from the regression analyses that had already been performed, it was obvious that small, medium, and large-volume consignees were affected by different variables. To examine aggregate effects, a mixture of 400 consignees (the largest that the SNAP/IEDA package could accommodate) was selected for analysis. Selection of the 400 consignees to be used was accomplished in a random manner while maintaining the percentage of small, medium, and large-volume consignees at the same level that was present in the original sample of 556 consignees. The results of this regression are listed below.

| | | |
|--|---------------|----------------|
| 400 Consignee Mix | $R^2 = 0.596$ | SE-DPV = 7.318 |
| Equation $t = 9.808 - 8.563 \text{ (SCP)} + 1.271 \text{ (1/BBPV)} + 0.339 \text{ (ADEL)}$ | | |
| SERC | (1.061) | (0.095) |

Examination of the regression equation reveals several interesting facts. Firstly, the average age of cargo at stuff (t) is dependent upon three variables: the single consignee volume proportion; the break-bulk point volume; and the average days between lifts.

This result was expected. To begin, the value $1/BBPV$ was most significant in the small-volume consignee regression analysis. Since, as previously discussed, the mixture of 400 was done on a proportional basis, a plurality of the 400 consignees are of the small-volume category. Therefore, the effect of $1/BBPV$ is an integral part of the regression equation signifying that the larger the break-bulk point volume, the smaller will be the value of the average age of cargo at stuff.

The single consignee proportion was most significant in the medium-volume category and, as expected, entered the regression analysis. Surprisingly, however, the single consignee proportion in the mix of 400 tends to decrease the average age of cargo at stuff instead of increasing that value as it did previously in both the medium-volume category and the fifty-two largest group. Apparently, other factors have an effect on this variable when analyzing the mixture of small, medium, and large-volume consignees together.

Lastly, the average days between lifts entered the equation. While this variable was found to have its most profound effect on the large-volume consignees, it did, however,

affect all categories adversely, i.e., it increased the age. This same effect held true in the analysis of the four hundred.

In summary, it can be seen quite readily that the average age of cargo at stuff (t) increases as the break-bulk point volume decreases and the average days between lifts increases, and t decreases as the single consignee proportion increases.

Other transformations were attempted with the data in an effort to generate a better fit. These included: the break-bulk volume was divided by the consignee volume in the first trial while this same transformation plus the product of the single consignee proportion and the consignee volume were utilized in the second attempt. Both attempts resulted in poor fits with high standard errors for the dependent variable and the regression coefficients and R^2 values of 0.102 and 0.078 respectively.

The various regression analyses performed in this third phase of the data analysis procedures illustrated some interesting points. They showed that the single consignee proportion affected t differently for different types of consignees. They showed that the average days between lifts was an important and significant variable in all of the groups analyzed. Most importantly, however, the analyses demonstrated that relationships among variables can be more clearly understood by dividing the consignees into volume

groups vis-a-vis aggregating them across the small to large spectrum.

VI. EVALUATION OF PROCEDURES

A. CRITIQUE OF THE PHASES EMPLOYED

The various procedures utilized during the work on this thesis have been described in some detail on the preceding pages. An evaluation of these procedures will be discussed in this chapter.

1. Distribution Audit

The initial step in the thesis work was the distribution audit. It is important to realize how essential this step is for understanding the nature of the transportation system being examined. Without a thorough and intelligent dissection of all the data, it is quite easy to proceed down blind alleys and never comprehend the major problems in the system. Therefore, the distribution audit is conducted with the knowledge that more advanced and expansive work based upon these results will follow.

In accomplishing this part of the work, several programs were developed in an effort to cover major aspects of the data, and to lay bare the variables that might in some particular circumstance have a bearing on the overall operation of the container stuffing station and the type of performance that the individual consignee could expect. In short, the distribution audit is the starting point and the foundation on which other analysis techniques are built.

2. Container Stuffing Performance Variation Analysis

The analysis of the variation in the variables constituted the second major phase of the analysis procedure and made extensive use of the output of the simulation model.

a. Critique of the Simulation Model

A general definition of simulation is: a quantitative technique used for evaluating alternative courses of action based upon facts and assumptions with a computerized mathematical model in order to represent actual decision-making under conditions of uncertainty.

The ability of the simulation model to replicate stuffing station activities was obviously a principal factor influencing the results of this thesis work. Several steps have been taken to validate the model. Reference 16 refers. Among these are the following: subjective comparison of the assumptions of the model and trial simulation outputs with actual container stuffing station operations, consultation with experienced managers, adjustment of parameters to conform with real world operations, and the performance of test cross-checking of individual program modules to insure integrity of program logic and coding. Nevertheless, the model is still an approximation of actual operations. Hence, in order to work with this realized deficiency and at the same time obtain meaningful results, it was decided that the model could best be utilized in the role of a vehicle that measured relative impacts vis-a-vis

absolute ones. It is in this framework that the simulation model was utilized as an integral part of the applied procedures cycle.

There are several features of simulation that make it the best method. Simulation involves the construction of some type of mathematical model that describes the system's operation in terms of individual components and events. Moreover, it is a means of dividing the model building process into smaller component parts and then combining them in their natural, logical order so that the computer can be programmed to present the effect of their interactions with one another. In essence, the simulation model performs experiments on the sample data inputs rather than on the entire operation, since the latter would be too time-consuming, inconvenient, and expensive.

Computer simulation allows one to incorporate time into an analysis of an essentially dynamic situation. In a computer simulation of business operations such as the container stuffing station, one can compress the results of several years of operations into a few minutes of running time on the computer. A computer simulation study is completely repeatable, i.e., the user exercises complete control over development of the model and the use of simulation routines. It is ideal for the collection and processing of quantitative data and free from the physical limitations on the system being studied since the system is represented in purely symbolic terms.

With these points in mind, the output from program seven was analyzed. As stated previously, inordinate variations do exist for the thirteen major PODs in all of the performance variables. These variations were considered significant to the problem identification in the thesis work. In other words, the ability to accurately predict is greatly affected by the size of the variations in the independent variables that determine/affect the predicted value (the dependent variable). Thus, a large amount of variation, as that realized in the second phase, points out clearly the inability one would have in predicting with a high degree of confidence and low standard error the average age of cargo at stuff.

3. Regression Analysis

There are several limitations and pitfalls associated with linear regression and correlation analysis that need to be given special attention. These may be categorized as being due to: (1) violations of the theoretical assumptions; (2) improper use of the regression equation and correlation coefficient; and (3) misinterpretation of these coefficients. It should always be kept foremost in the mind of the user of this technique that regression and correlation are powerful tools, but must be used with care.

Care must be taken in using past data to determine a future relationship. When regression is used for forecasting, as it often is, the source of the data is history, so that often a time span of many years is encompassed by

the observed dependent variable values. Thus, if there is reason to believe that the values of the dependent variable are becoming more or less volatile over time, a critical assumption of regression analysis is violated. The net effect of such violations is that probabilistic interpretations of inferences are invalid and cannot be used.

In establishing a regression equation, a set of observations is used that covers a limited range of values for the independent variables. Cautions must be exercised when making predictions of the dependent variable whenever the independent variables fall outside of this range. Regression analysis is limited only to the range of actual observations. It is these observations, not qualitative reasoning, that are used to quantify the relationships between the independent variables and the dependent variable.

Good common sense must be exercised in selecting variables for which there is good, meaningful nonstatistical explanation of their influence on the dependent variable.

In measuring the strength of the association between two variables in multivariate analysis, the partial coefficient of determination is of principal importance. This index expresses the correlation between two variables after the effect of all other variables has been considered.

One point of special emphasis should be made at this point. No results from the generation of the technique utilized and described throughout this thesis are any better than the sound, intelligent judgment utilized in their

translation and interpretation. No method, no matter how reliable, can be substituted for the human element and that particular entity's ability to think, use good judgment, and, at the same time, maintain a continuous ability to remain flexible to changes in the environment in which he knows his decisions must be made.

B. RELATED RESULTS

The results obtained by this thesis, could be used effectively by the management at MOTBA in many ways.

For example, in achieving their assigned mission of monitoring the operations at the container stuffing station, top management might find it beneficial to develop control charts for the individual PODs and consignees so that they would know the ranges of performance to expect. Utilization of such charts in regularly scheduled conferences with representatives of the consignees could prove informative to all concerned. The development of simple, concise reports for top management using the information would perhaps improve the quality of the reports and at the same time make them more operationally effective.

In any type of a service-oriented business, it is imperative that both the provider and recipient of said service be aware of the product that they are marketing and the way in which it is being sent and received. Therefore, anything that can improve this communication should be considered in the light of limited budgets and cost-effectiveness.

While this thesis divorced itself of any cost considerations, it certainly is common sense to assume that some type of intelligent, meaningful liaison that utilizes the information presented in this paper would have beneficial effects on the overall operation of the export cargo transportation system at MOTBA.

VII. CONCLUSION

This thesis concerned itself with one element, the container stuffing station, of the containerized export cargo transportation system. No changes or variations were made to the system which would in any way affect its operation. The data used for all phases of the analysis was that obtained through actual operations at the Container Stuffing Station, MOTBA, for a four-month period of 1973.

Data analysis techniques were utilized to determine how to effectively evaluate the performance of the container stuffing station and what factors influence the age of cargo at stuff. To accomplish these two goals, three separate phases of data analysis techniques were employed: the distribution audit, the variation analysis of variables, and regression analysis.

The distribution audit employed six computer programs to systematically dissect the large volume of raw data in order that the complex and diverse activities at the container stuffing station might be viewed. The following information illustrates this diversity. During the 123 day period for which data was available, a total of 43,984 shipments were processed through the container stuffing station for shipment to 110 PODs servicing 1822 consignees. These shipments had a total volume of 3,620,506 cubic feet and a combined weight of 65,695,580 lbs. Forty major

consignees (2.2%) accounted for 60% of the total activity during this period while four-fifths (79.8%) received less than ten shipments.

The variation analysis of the variables, which was conducted by means of a computer program and employed data generated by a container stuffing station simulation model which considered thirteen (13) major PODs, illustrated the wide disparity found on a monthly basis among three important factors of concern to managers of a containerized export cargo transportation system, namely, the average age of cargo at stuff, cube utilization of the containers, and single consignee proportion. This phase demonstrated that wide ranges could be expected for these relevant performance measures over an extended operating period.

Thus, the first two phases demonstrated, by the use of seven computer programs, that it was possible to quantitatively evaluate the container stuffing station operation.

Several interesting points can be extracted from the regression analysis concerning the average age of cargo at stuff. For the 277 small-volume consignees, this value was affected by two variables, the break-bulk point volume (the most significant) and the average days between lifts; for the 143 medium-volume consignees, by three variables, the total volume in single consignee vans, the single consignee proportion (the most significant), and the average days between lifts; and for the 136 large-volume consignees, by

two variables, the consignee volume and the average days between lifts (the most significant).

Thus, while the small and medium-volume consignees can, through a variety of methods involving ordering and mixing of cargo, alter the average age of cargo at stuff, the large-volume consignees have little control over this variable because the age of cargo for them is determined primarily by the frequency of ship arrivals, viz., the average days between lifts variable.

Furthermore, the regression analysis illustrated that a much better fit can be produced when the consignees are divided on some common basis such as total volume instead of being aggregated into one general grouping. When mixing of the consignees was done, the SE-DPV and SERC values increased and the R^2 value decreased making it much more difficult to determine the relationship between the various independent variables and the average age of cargo at stuff.

The end result of the data analysis techniques is two-fold. Firstly, a quantitative evaluation can be conducted in which raw data is examined and analyzed for pertinent information. Secondly, the age of cargo at stuff, an important performance parameter at the container stuffing station, can be employed as the dependent variable and through regression analyses, a determination can be made as to what variables affect it.

These two points are important to both the monitoring element at MOTBA whose mission it is to oversee the activities

at the stuffing station and the individual consignee whose well-being is directly related to the ability of the stuffing station to accomplish its objective of responsive, inexpensive, and secure shipping to the numerous overseas commands of the United States.

APPENDIX A

Table I. CONTAINER DESCRIPTION

| <u>CARRIER</u> | <u>SIZE</u> | <u>MAX. CUBE</u> | <u>MAX. WEIGHT</u> | <u>NUMBER</u> |
|----------------|-------------|----------------------|------------------------|---------------|
| AML | 20 | 1119 | 40,000 | 1 |
| AML | 40 | 2565 | 46,000 | 2 |
| APL | 20 | 1134 | 40,300 | 3 |
| APL | 40 | 2394 | 45,000 | 4 |
| MTSN | 20 | 1100 | 40,000 | 5 |
| MTSN | 24 | 1427 | 46,200 | 6 |
| MTSN | 40 | 2386 | 46,200 | 7 |
| PFEL | 20 | 1157 | 40,300 | 8 |
| PFEL | 40 | 2398 | 46,000 | 9 |
| SLND | 35 | 2090 | 45,000 | 10 |
| SSC | 20 | 1144 | 38,000 | 11 |
| SSC | 40 | 2383 | 46,000 | 12 |
| STLZ | 27 | 1791 | 46,000 | 13 |
| STLZ | 40 | 2381 | 46,000 | 14 |
| USLX | 20 | 1105 | 40,000 | 15 |
| USLX | 40 | 2398 | 46,000 | 16 |

- Note: (1) Size is length in feet.
- (2) Max. Cube is in cubic feet.
- (3) Max. Weight is in pounds.
- (4) Number is the number used by computer for simulation runs.
- (5) AML - American Mail Line;
 APL - American President Lines;
 MTSN - Matson Navigation Company;
 PFEL - Pacific Far East Lines;
 SLND - Sea-Land Service;
 SSC - States Steamship Company;
 STLZ - Seatrain Lines;
 USLX - United States Lines.

Table II. SAMPLE FORMULAE

Average age of cargo at stuff (t) for a POD or consignee.

$$t = \frac{\sum t_i}{\sum x_i}$$

x_i = individual shipments
 $i = (1, \dots, n)$.

t_i = age of individual shipments
in days $i = (1, \dots, n)$.

Standard deviation of age of cargo at stuff (t_{sd}).

$$t_{sd} = \frac{\sum (t_i)^2 - \frac{(\sum t_i)^2}{n}}{n}$$

n = number of last shipment
segments.

Cube utilization by container type (u) for a POD.

$$u_j = \frac{\sum v_i}{C_j N_j}$$

$j = (1, \dots, 16)$ for the 16
different types of containers
available.

v_i = Volume of individual ship-
ments $i = (1, \dots, n)$.

N_j = number of containers of type
 j that are used $j = (1, \dots, 16)$.

c_j = total volume available for
that type container
 $j = (1, \dots, 16)$.

Standard deviation of cube utilization ($u_{j_{sd}}$) for a POD.

$$u_{j_{sd}} = \frac{\sum (v_i)^2 - \frac{(\sum v_i)^2}{C_j N_j}}{C_j N_j}$$

Single consignee proportion (p) by container type for a POD.

$$p_j = \sum \frac{V_{js}}{V_{jt}}$$

V_{js} = volume (cu. ft.) in single
consignee vans.

V_{jt} = total volume shipped to
individual consignee.

Table III. ALPHABETIZED RAW DATA

The following table is an example of the raw shipment data collected by MOTBA on the Container Stuffing Station operation for the period under consideration after it was arranged in alphabetic order by the computer.

| POD | CONSIGNEE | TYPE CARGO | VOLUME Cu.Ft. | WEIGHT lbs. | NUMBER PIECES | RECEIPT DATE | WATER COMM. CODE | TRANS. ACCOUNTING CODE |
|-----|-----------|---------------|------------------|----------------|------------------|-----------------|------------------------|------------------------------|
| | CX4872 | Y | 48 | 2688 | 96 | 108 | 645 | A000 |
| AF4 | FE4684 | Z | 184 | 4725 | 1 | 13 | 518 | F8A0 |
| BA1 | AF6102 | Q | 394 | 10640 | 7 | 32 | 532 | A205 |
| BA1 | AF6149 | Z | 150 | 4140 | 3 | 87 | 508 | A205 |
| BA4 | M95121 | Z | 1300 | 5806 | 358 | 108 | 729 | M311 |
| CKA | AF3225 | Z | 184 | 3680 | 1 | 13 | 518 | A240 |
| CK2 | N00389 | Z | 450 | 15750 | 450 | 61 | 518 | N104 |
| HA4 | FB5587 | Z | 5 | 42 | 1 | 53 | 700 | F8A0 |
| JF1 | AK4733 | Z | 166 | 1252 | 1 | 27 | 390 | A13E |
| JF1 | FG5621 | Z | 2 | 36 | 1 | 79 | 700 | F8A0 |
| JG1 | FB5620 | N | 23 | 526 | 1 | 59 | 635 | F8A0 |
| RA3 | AT0499 | Z | 12 | 90 | 2 | 109 | 700 | A205 |
| RA3 | BTHB01 | Z | 31 | 1238 | 2 | 44 | 590 | A452 |
| RA3 | CT0911 | | 123 | 2847 | 3 | 5 | | A209 |
| RA3 | CT0911 | G | 7 | 234 | 3 | 11 | 543 | A209 |
| RA3 | CT0911 | R | 2 | 44 | 2 | 34 | 705 | A209 |
| UD6 | AT4213 | Z | 140 | 6600 | 200 | 81 | 51W | A000 |

Table IV. DATA SUMMARY FOR DISTRIBUTION AUDIT

| | |
|---|----------------------|
| Period Analyzed - 1 July to 31 October 1973 | 123 days |
| Shipments | 43,984 shipments |
| Volume of Cargo | 3,620,506 cubic feet |
| Weight of Cargo | 65,695,580 pounds |
| Number of PODs | 110 |
| Number of Consignees | 1,822 |

Table V. INFORMATION OBTAINED FROM DATA

The specific items that were identified during the distribution audit are listed below.

| <u>ITEMS IDENTIFIED</u> | <u>POD</u> | <u>BASIS</u> | <u>CONSIGNEE</u> |
|---|------------|--------------|------------------|
| Volume - by Shipment | | | |
| Total for period | X | | X |
| Average per shipment | X | | X |
| Std. Deviation | X | | X |
| Intervals for shipments | X | | X |
| Weight - by Shipment | | | |
| Total for period | X | | X |
| Average per shipment | X | | X |
| Std. Deviation | X | | X |
| Intervals for shipments | X | | X |
| Density - by Shipment | | | |
| Average per shipment | X | | X |
| Std. Deviation | X | | X |
| Exception Handling Codes | X | | |
| Commodity Codes | X | | |
| Consignee activity at Container | | | |
| Stuffing Station (Volume and | | | |
| Weight Intervals and Percentage | | | X |
| breakdown) | | | |
| Daily operational activity at Container | | | |
| Stuffing Station (Daily Volume, Weight, | | | |
| and Shipment breakdown) | | | |

Table VI. CONTAINER STUFFING STATION DAILY SUMMARY

| <u>DAY</u> | <u>NO. DAYS</u> | <u>NUMBER SHIP.</u> | <u>AVERAGE NO. SHIP.</u> | <u>TOTAL VOLUME</u> | <u>AVERAGE VOLUME</u> | <u>TOTAL WEIGHT</u> | <u>AVERAGE WEIGHT</u> |
|----------------|---------------------|-------------------------|------------------------------|-------------------------|---------------------------|-------------------------|---------------------------|
| Sunday | 18 | 165 | 9.16 | 15,539 | 863 | 185,244 | 10,291 |
| Monday | 15 | 7,361 | 490.73 | 619,571 | 41,305 | 10,620,776 | 708,052 |
| Tuesday | 18 | 9,087 | 504.83 | 729,762 | 40,542 | 12,689,115 | 704,951 |
| Wednesday | 17 | 8,491 | 499.47 | 702,719 | 41,336 | 13,492,636 | 793,684 |
| Thursday | 17 | 9,701 | 570.64 | 779,457 | 45,850 | 14,695,248 | 864,426 |
| Friday | 17 | 8,979 | 528.17 | 754,007 | 44,353 | 13,716,614 | 806,859 |
| Saturday | 17 | 152 | 8.94 | 12,036 | 708 | 146,236 | 8,602 |
| Holiday | 4 | 48 | 12.00 | 7,415 | 1,854 | 149,711 | 37,428 |
| Daily Averages | | 358 | | | 29,435 | | 534,110 |

Table VII. CONTAINER STUFFING STATION WEEKLY SUMMARY

| <u>WEEK</u> | <u>NUMBER SHIPMENTS</u> | <u>VOLUME</u> | <u>WEIGHT</u> |
|----------------|-----------------------------|---------------|---------------|
| 1. | 2,444 | 261,448 | 3,921,219 |
| 2. | 2,797 | 287,444 | 4,527,403 |
| 3. | 3,141 | 278,591 | 4,997,751 |
| 4. | 2,758 | 232,296 | 3,571,542 |
| 5. | 3,414 | 284,814 | 5,151,369 |
| 6. | 4,044 | 308,446 | 5,844,244 |
| 7. | 965 | 88,024 | 1,484,204 |
| 8. | 2,805 | 208,179 | 3,908,164 |
| 9. | 2,641 | 196,694 | 3,625,615 |
| 10. | 1,994 | 164,170 | 3,071,826 |
| 11. | 2,425 | 206,833 | 3,837,876 |
| 12. | 2,787 | 215,422 | 4,308,528 |
| 13. | 2,485 | 199,702 | 4,533,720 |
| 14. | 2,521 | 192,863 | 3,600,097 |
| 15. | 1,784 | 135,552 | 2,378,525 |
| 16. | 2,653 | 194,328 | 3,842,275 |
| 17. | 1,983 | 140,028 | 2,857,312 |
| Weekly Average | 2,503 | 206,054 | 3,738,773 |

Table VIII. TYPE OF CARGO CODE

| <u>CODE</u> | <u>TYPE OF CARGO</u> |
|-------------|--|
| A | Radioactive |
| B | Unassigned |
| C | Concurrent HHG or POV |
| D | Contaminated Cargo (other than Label) |
| E | Dangerous Articles (Empty Label) |
| F | Fireworks |
| G | Green Label (Nonflammable Gases) |
| H | Subject to damage from heat |
| I-L | Unassigned |
| M | Magnetic |
| N | Dangerous Articles (no label required) |
| O | Unassigned |
| P | Poison |
| Q | Subject to damage from freezing |
| R | Red Label (Explosives, Inflammable Liquids or Gases) |
| S | Poison Gas Label |
| T | Tear Gas Label |
| U-V | Unassigned |
| W | White Label (Acids, Alkaline Caustic Liquids) |
| X | Unassigned |
| Y | Yellow Label (Inflammable Solids or Oxidizing Material) |
| Z | No special type of cargo code applicable |

Note: "Label" means the caution label that is required to be placed on the cargo by government regulations.

Table IX. WATER COMMODITY CODES

| <u>CODE SERIES</u> | <u>COMMODITY GROUP</u> |
|--------------------|--------------------------------|
| 100-149 | Chill |
| 150-199 | Freeze |
| 200-299 | Bulk |
| 300-359 | Privately Owned Passenger Veh. |
| 360-389 | Baggage |
| 390-399 | Household Goods |
| 400-489 | Ammunition and Explosives |
| 490-499 | Radioactive Waste |
| 500-799 | General Cargo |
| 800-899 | Special Cargo |
| 900-999 | Aircraft (assembled) |

Table X. TABULAR DATA - 13 MAJOR PODS

SHIPMENTS

| | |
|---|--------|
| Total Shipments of 13 PODS | 36,537 |
| Total Shipments of all PODS | 43,984 |
| Percentage of Total Shipments (13 PODS) | 83.07% |

VOLUME

| | |
|--------------------------------------|------------------|
| Total Volume of 13 PODS | 2,989,037 cu.ft. |
| Total Volume of all PODS | 3,620,506 cu.ft. |
| Average Volume/Shipment (13 PODS) | 72.903 cu.ft. |
| Percentage of Total Volume (13 PODS) | 82.56% |

WEIGHT

| | |
|--------------------------------------|-----------------|
| Total Weight of 13 PODS | 51,777,785 lbs. |
| Total Weight of all PODS | 65,695,580 lbs. |
| Average Weight/Shipment (13 PODS) | 1,167.435 lbs. |
| Percentage of Total Weight (13 PODS) | 78.81% |

DENSITY

| | |
|----------------------------|--------------------|
| Average Density of 13 PODS | 22.776 lbs./cu.ft. |
|----------------------------|--------------------|

Table XI. SAMPLE SIMULATION DATA-1

Container Type No. 10

POD No. 1

| <u>MONTH</u> | <u>NUMBER OF CONTAINERS</u> | <u>AVERAGE AGE</u> | <u>AVERAGE CUBE UTILIZATION</u> | <u>SINGLE CONSIGNEE PROPORTION</u> |
|-----------------------------|---------------------------------|------------------------|---|--|
| 1 | 55 | 6.282 | 76.836 | 1.000 |
| 2 | 37 | 5.530 | 68.459 | 0.865 |
| 3 | 29 | 3.982 | 69.898 | 0.828 |
| 4 | 26 | 5.752 | 77.692 | 0.846 |
| 5 | 67 | 8.798 | 75.313 | 0.925 |
| 6 | 56 | 8.806 | 75.429 | 0.929 |
| 7 | 45 | 6.943 | 74.978 | 0.889 |
| 8 | 33 | 9.673 | 78.212 | 0.758 |
| 9 | 35 | 7.376 | 79.229 | 0.943 |
| 10 | 34 | 8.855 | 74.235 | 0.794 |
| 11 | 38 | 4.988 | 73.500 | 0.921 |
| 12 | 42 | 6.920 | 77.452 | 0.810 |
| 13 | 43 | 7.517 | 72.930 | 0.907 |
| 14 | 53 | 11.456 | 74.302 | 0.868 |
| 15 | 19 | 7.820 | 78.474 | 0.789 |
| 16 | 42 | 7.572 | 73.405 | 0.714 |
| 17 | 49 | 6.466 | 74.694 | 0.918 |
| 18 | 51 | 7.756 | 75.529 | 0.882 |
| 19 | 44 | 5.161 | 74.795 | 0.886 |
| 20 | 41 | 7.539 | 76.122 | 0.854 |
| 21 | 38 | 8.170 | 73.658 | 0.711 |
| 22 | 45 | 7.946 | 73.067 | 0.911 |
| 23 | 35 | 9.630 | 75.457 | 0.857 |
| 24 | 49 | 7.118 | 72.367 | 0.857 |
| <hr/> | | | | |
| Totals Two Yr. Period | 1006 | 7.610 | 74.769 | 0.870 |
| <hr/> | | | | |
| Range of Obs. | 19 to 67 | 3.982 to 11.456 | 68.459 to 79.229 | 0.711 to 1.000 |

Table XII. SAMPLE SIMULATION DATA-2

Container Type No. 8

POD No. 7

| <u>MONTH</u> | <u>NUMBER OF CONTAINERS</u> | <u>AVERAGE AGE</u> | <u>AVERAGE CUBE UTILIZATION</u> | <u>SINGLE CONSIGNEE PROPORTION</u> |
|--------------|---------------------------------|------------------------|---|--|
| 1 | 33 | 5.741 | 76.879 | 0.909 |
| 2 | 109 | 9.878 | 79.037 | 0.982 |
| 3 | 36 | 5.000 | 78.917 | 0.917 |
| 4 | 48 | 12.353 | 79.354 | 0.938 |
| 5 | 18 | 13.378 | 82.500 | 0.833 |
| 6 | - | - | - | - |
| 7 | 26 | 5.959 | 82.346 | 0.932 |
| 8 | 69 | 9.875 | 79.478 | 0.942 |
| 9 | 46 | 11.495 | 81.413 | 0.978 |
| 10 | 36 | 10.191 | 79.222 | 0.972 |
| 11 | 9 | 5.487 | 73.222 | 0.889 |
| 12 | 27 | 2.614 | 80.852 | 0.926 |
| 13 | 47 | 6.397 | 77.915 | 0.979 |
| 14 | 85 | 10.255 | 78.788 | 0.976 |
| 15 | 41 | 4.153 | 81.512 | 1.000 |
| 16 | 47 | 11.188 | 79.128 | 0.936 |
| 17 | 21 | 2.162 | 80.429 | 1.000 |
| 18 | 37 | 10.878 | 78.811 | 0.946 |
| 19 | 2 | 4.652 | 71.000 | 0.500 |
| 20 | 53 | 11.217 | 79.774 | 0.943 |
| 21 | 67 | 14.436 | 81.776 | 0.940 |
| 22 | 31 | 6.655 | 80.161 | 0.968 |
| 23 | 15 | 13.676 | 77.600 | 0.867 |
| 24 | 19 | 3.718 | 75.263 | 0.895 |
| <hr/> | | | | |
| Total | | | | |
| Two Yr. | 922 | 9.405 | 79.505 | 0.950 |
| Period | | | | |
| <hr/> | | | | |
| Range | 0 | 2.162 | 71.000 | 0.500 |
| of | to | to | to | to |
| Obs. | 109 | 14.436 | 82.500 | 1.000 |

Table XIII. SAMPLE SIMULATION DATA-3

Container Type No. 6

POD No. 13

| <u>MONTH</u> | <u>NUMBER OF CONTAINERS</u> | <u>AVERAGE AGE</u> | <u>AVERAGE CUBE UTILIZATION</u> | <u>SINGLE CONSIGNEE PROPORTION</u> |
|-----------------------------|---------------------------------|------------------------|---|--|
| 1 | 31 | 8.425 | 87.000 | 1.000 |
| 2 | 41 | 6.180 | 81.439 | 0.902 |
| 3 | 21 | 5.120 | 81.667 | 0.857 |
| 4 | 14 | 7.693 | 84.786 | 1.000 |
| 5 | 30 | 8.089 | 85.233 | 1.000 |
| 6 | 50 | 2.608 | 82.640 | 0.920 |
| 7 | 39 | 4.549 | 78.872 | 0.872 |
| 8 | 17 | 9.219 | 79.824 | 1.000 |
| 9 | 96 | 6.789 | 86.573 | 1.000 |
| 10 | 42 | 8.799 | 83.952 | 0.929 |
| 11 | 11 | 3.198 | 85.545 | 0.909 |
| 12 | 22 | 7.712 | 76.500 | 0.727 |
| 13 | 14 | 4.075 | 82.857 | 0.929 |
| 14 | 55 | 10.339 | 84.345 | 1.000 |
| 15 | 12 | 3.763 | 69.583 | 0.667 |
| 16 | 15 | 2.902 | 82.133 | 1.000 |
| 17 | 9 | 6.106 | 81.556 | 0.889 |
| 18 | 95 | 9.141 | 84.537 | 1.000 |
| 19 | 47 | 5.450 | 81.596 | 0.851 |
| 20 | 14 | 3.696 | 74.500 | 0.786 |
| 21 | 36 | 7.877 | 85.444 | 0.861 |
| 22 | 53 | 10.924 | 80.925 | 0.887 |
| 23 | 41 | 5.182 | 79.805 | 0.854 |
| 24 | 25 | 7.037 | 81.080 | 0.800 |
| ----- | | | | |
| Totals Two Yr. Period | 830 | 6.900 | 82.764 | 0.923 |
| ----- | | | | |
| Range of Obs. | 9 to 96 | 2.608 to 10.924 | 69.583 to 87.000 | 0.667 to 1.000 |

Table XIV. CONSIGNEE ACTIVITY LEVELS

The 13 major PODs account for 36,537 shipments or 83.1% of the total number handled during the period under consideration. There are 556 consignees that are serviced by the 13 PODs and the following table provides a delineation of the activity that each consignee contributes to the POD (proportion by volume).

| Activity Rate | Number of Consignees | Percentage of Consignees |
|------------------|-------------------------|-----------------------------|
| Less than .1% | 277 | 49.8 |
| .1% - .99% | 143 | 25.7 |
| 1% - 2% | 48 | 8.6 |
| 2% - 3% | 16 | 2.9 |
| 3% - 4% | 20 | 3.6 |
| 4% - 5% | 4 | 0.7 |
| 5% - 7% | 12 | 2.2 |
| 7% - 10% | 8 | 1.4 |
| 10% - 15% | 7 | 1.2 |
| 15% - 20% | 2 | 0.4 |
| 20% - 30% | 9 | 1.6 |
| Greater than 30% | 10 | 1.8 |

Table XV. LARGE CONSIGNEE BREAKDOWN

| POD | No. CONSIGNEES | Percentage of Volume | | | | | | | | | | Over 30 |
|-----|-------------------|----------------------|------------|------------|------------|------------|-------------|--------------|--------------|--------------|---|------------|
| | | <u>1-2</u> | <u>2-3</u> | <u>3-4</u> | <u>4-5</u> | <u>5-7</u> | <u>7-10</u> | <u>10-15</u> | <u>15-20</u> | <u>20-30</u> | | |
| RA3 | 14 | 2 | 4 | 4 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | |
| RJ1 | 14 | 4 | 0 | 3 | 1 | 3 | 1 | 0 | 0 | 2 | 0 | |
| RJ3 | 13 | 3 | 1 | 2 | 2 | 1 | 0 | 3 | 0 | 1 | 0 | |
| SA1 | 13 | 8 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | |
| TA2 | 12 | 3 | 1 | 1 | 2 | 2 | 1 | 0 | 0 | 1 | 1 | |
| UB1 | 12 | 8 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | |
| UC2 | 6 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| UD6 | 13 | 5 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 0 | |
| UL7 | 5 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | |
| UN1 | 11 | 4 | 1 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | |
| UM4 | 8 | 2 | 2 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | |
| UQ2 | 4 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | |
| XE2 | 11 | 5 | 2 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | |

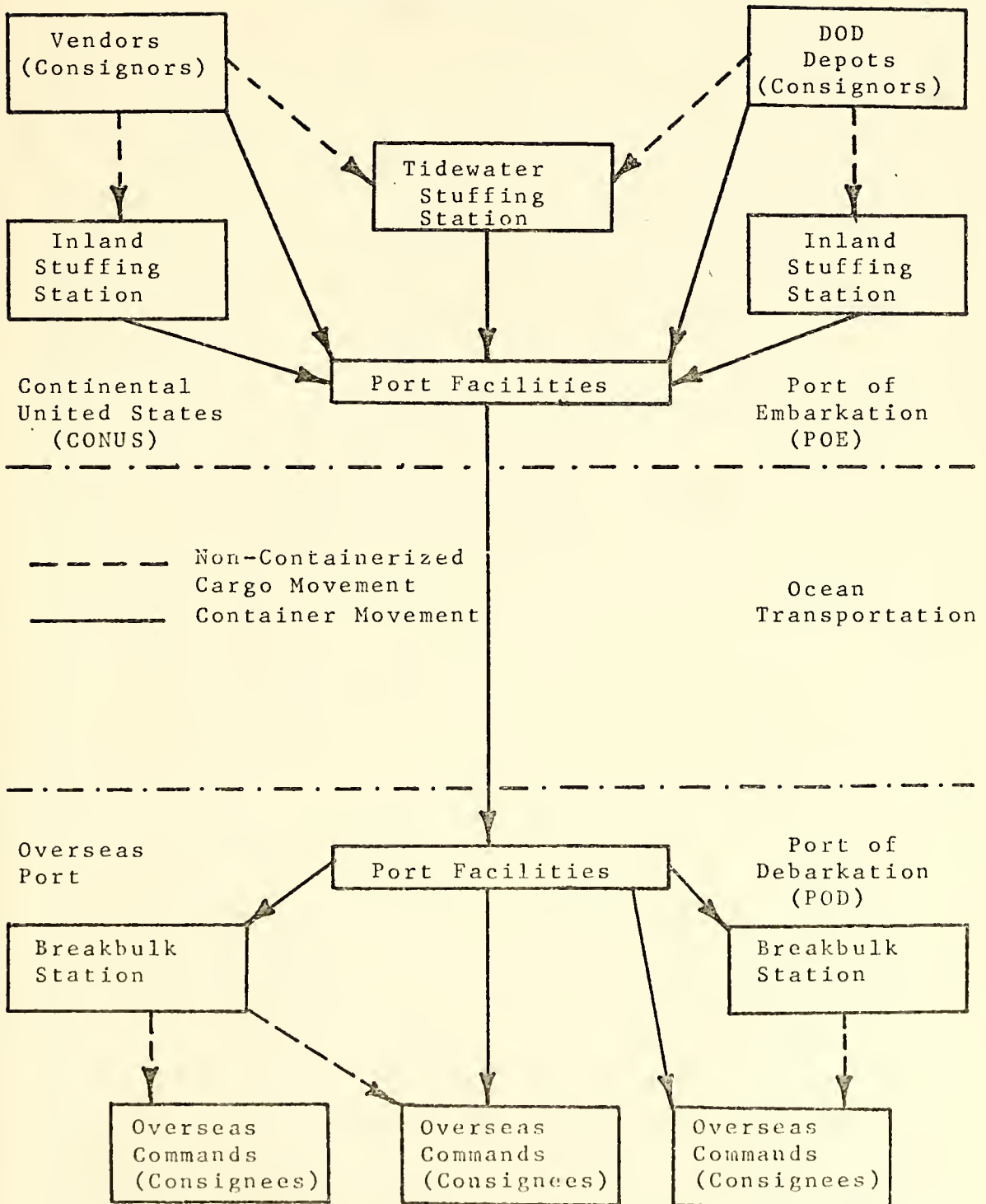
Table XVI. REGRESSION SUMMARY TABLE

| | | |
|---|---------------|-----------------|
| 1. Small Consignees (277) | $R^2 = 0.707$ | SE-DPV = 7.018 |
| Equation $t = 8.218 + 0.201 (1/BBPV) + 0.384 (ADBL)$ | | |
| SERC | (0.008) | (0.126) |
| 2. Medium Consignees (143) | $R^2 = 0.425$ | SE-DPV = 23.575 |
| Equation $t = -7.600 - 0.004 (TVSCC) + 77.097 (SCP) + 2.309 (ADBL)$ | | |
| SERC | (0.001) | (8.632) (0.595) |
| 3. Large Consignees (136) | $R^2 = 0.449$ | SE-DPV = 5.064 |
| Equation $t = 4.838 + 0.022 (1/CV) + 0.765 (ADBL)$ | | |
| SERC | (0.006) | (0.110) |

APPENDIX B

Figure 1

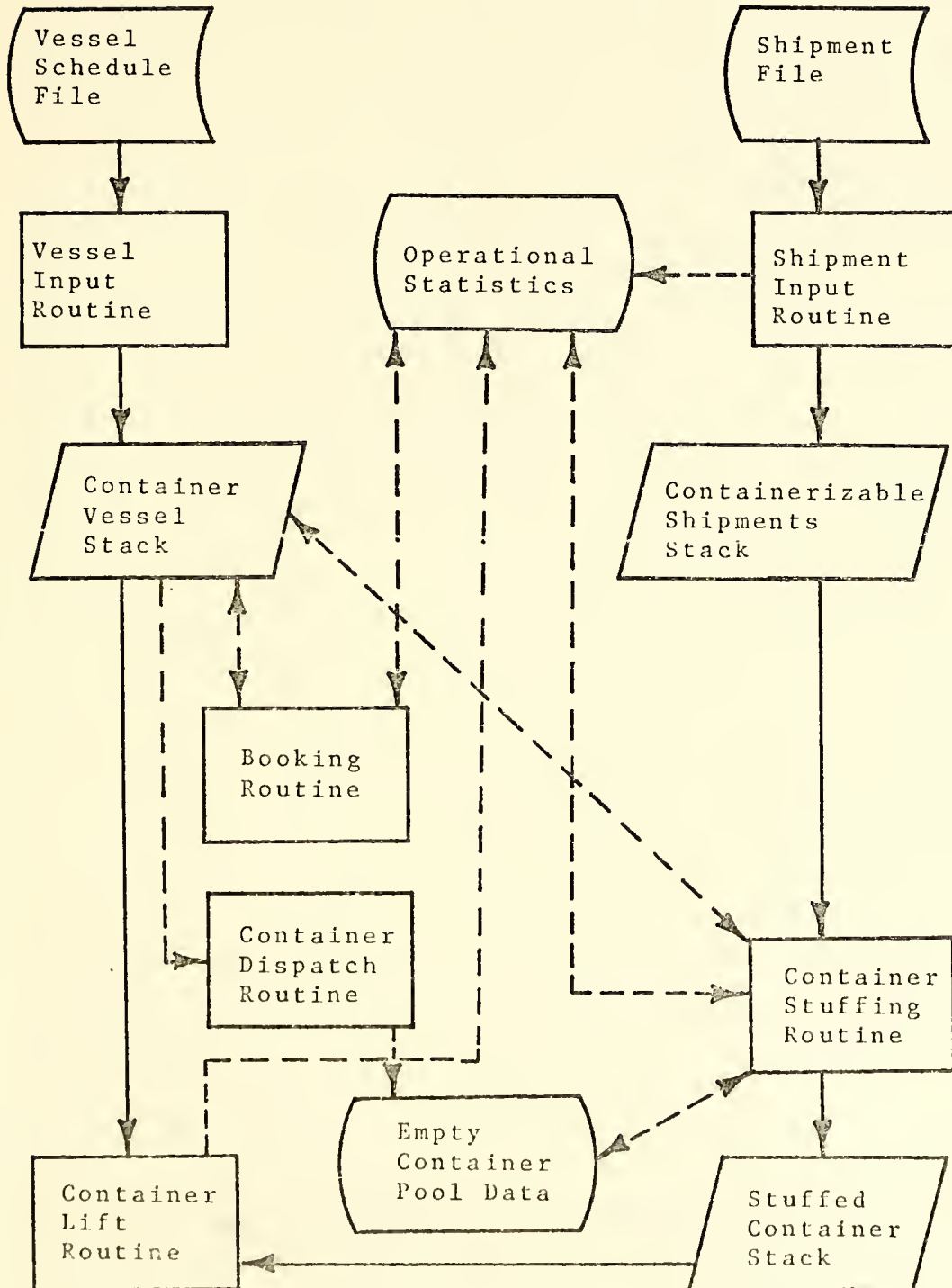
EXPORT CARGO MOVEMENT



APPENDIX B

Figure 2

GENERAL INFORMATION AND RECORD FLOW IN THE SIMULATION PROGRAM



COMPUTER OUTPUT ONE-1

THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR VOLUME MEASURED IN CUBIC FEET

[illegible]

THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR WEIGHT MEASURED IN POUNDS

| | TC | OI | 025 | 050 | 075 | 100 | 150 | 250 | 400 | 600 | 800 | 100C | 1500 | 2000 | 4000 | 7000 | 10000 | 14001 | 18001 | 25001 | OVER SHIP |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-------|-------|-------|-------|-------|--------------|
| PCCO | 000 | 011 | 026 | 051 | 076 | 101 | 151 | 251 | 401 | 601 | 801 | 1001 | 1501 | 2001 | 4001 | 7001 | 10001 | 14001 | 18001 | 25001 | |
| | TC | IC | TO | TC | TO | TO | TO | TO | TC | TC | TO | TO | TO | TC | TO | TO | TO | TC | TO | TO | |
| CAN | 010 | 025 | 050 | 075 | 100 | 150 | 250 | 400 | 600 | 800 | 1000 | 1500 | 2000 | 4000 | 7000 | 10000 | 14000 | 18000 | 25000 | 35000 | 35000 |

[illegible][illegible]

THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR DENSITY MEASURED IN POUNDS PER CU.FT.

202

30

70

כ

0.24

Q

Q

98

[illegible]

0000007-000000000000-1-2-0-00-0-00000000000000000000000000000000

0000H00H0.00H00000N00H0000H00H000000000000000000000000000000

00000000000000000000N-10000000-10000-1000000000-1000000000000N-000-1-10

00000000N000000000000000000000000F0F0F0F00N00000000000000

Figure 1

[illegible]

TTTTT TTTTNNNNNTTTT TTTT TTTTNNNNNTTTT TTTT TTTTNNNNNTTTT

COMPUTER OUTPUT ONE-3

TABLE 1. SUMMARY OF CONSIGNEE PERFORMANCE

96

THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR VOLUME MEASURED IN CUBIC FEET

97

COMPUTER OUTPUT TWO-2

THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR WEIGHT MEASURED IN POUNDS

| NO. | PCD | 000 | 010 | 011 | 012 | 013 | 014 | 015 | 016 | 017 | 018 | 019 | 020 | 021 | 022 | 023 | 024 | 025 | 026 | 027 | 028 | 029 | 030 | 031 | 032 | 033 | 034 | 035 | 036 | 037 | 038 | 039 | 040 | 041 | 042 | 043 | 044 | 045 | 046 | 047 | 048 | 049 | 050 | 051 | 052 | 053 | 054 | 055 | 056 | 057 | 058 | 059 | 060 | 061 | 062 | 063 | 064 | 065 | 066 | 067 | 068 | 069 | 070 | 071 | 072 | 073 | 074 | 075 | 076 | 077 | 078 | 079 | 080 | 081 | 082 | 083 | 084 | 085 | 086 | 087 | 088 | 089 | 090 | 091 | 092 | 093 | 094 | 095 | 096 | 097 | 098 | 099 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-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THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCURRENCE FOR SHIPMENTS IN EACH INTERVAL FOR DENSITY MEASURED IN POUNDS PER CU.FT.

[illegible]

COMPUTER OUTPUT TWO-4

TABULAR SUMMARY TABLE OF POD PERFORMANCE

| NC. | POD | NO. SHIP. | TCT. VCL. | AVE. VOL. | STD. DEV. VOL. | TCT. WGT. | AVE. WGT. | STD. DEV. WGT. | AVE. DEN. | STD. DEV. DEN. |
|-----|-----|-----------|-----------|-----------|----------------|-----------|-----------|----------------|-----------|----------------|
| 1 | AE4 | 5 | 735 | 147.000 | 265.576 | 7995 | 1555.000 | 2020.808 | 37.605 | 29.093 |
| 2 | AE4 | 105 | 915 | 229.230 | 741.375 | 18900 | 2725.000 | 35.000 | 22.456 | 5.514 |
| 3 | AE4 | 13 | 1415 | 137.330 | 222.222 | 22222 | 2138.757 | 4401.465 | 22.480 | 21.850 |
| 4 | AE4 | 13 | 3957 | 304.385 | 482.499 | 19482 | 1498.615 | 2090.928 | 4.354 | 15.712 |
| 5 | AE4 | 15 | 224 | 24.000 | 0.0 | 114 | 114.000 | 0.0 | 4.750 | 0.0 |
| 6 | AE4 | 15 | 2788 | 186.333 | 150.456 | 80701 | 530.066 | 7547.652 | 3.376 | 0.981 |
| 7 | AE4 | 14 | 1238 | 188.429 | 156.864 | 28309 | 2022.071 | 519.469 | 11.134 | 10.134 |
| 8 | AE4 | 11 | 2067 | 189.727 | 104.556 | 61528 | 2022.071 | 7218.242 | 8.283 | 8.283 |
| 9 | AE4 | 11 | 4 | 4.000 | 0.0 | 60 | 60.000 | 0.0 | 15.000 | 0.0 |
| 10 | AE4 | 15 | 291 | 19.000 | 0.0 | 30 | 30.000 | 0.0 | 15.000 | 0.0 |
| 11 | AE4 | 15 | 738 | 112.667 | 25.073 | 3965 | 264.333 | 28.155 | 20.417 | 20.417 |
| 12 | AE4 | 2 | 732 | 356.000 | 150.156 | 5567 | 1855.667 | 2534.598 | 3.367 | 3.367 |
| 13 | AE4 | 11 | 7 | 7.000 | 381.000 | 49106 | 24534.000 | 22020.512 | 11.596 | 22.469 |
| 14 | AE4 | 11 | 55 | 55.000 | 0.0 | 340 | 106.000 | 0.0 | 11.336 | 0.0 |
| 15 | AE4 | 147 | 143 | 10.214 | 0.0 | 2814 | 370.000 | 0.0 | 11.700 | 0.0 |
| 16 | AE4 | 147 | 375 | 60.500 | 19.918 | 61197 | 1302.064 | 52.777 | 11.562 | 9.638 |
| 17 | AE4 | 147 | 143 | 5.500 | 262.217 | 1129 | 1302.064 | 337.777 | 11.562 | 11.211 |
| 18 | AE4 | 134 | 132 | 135.643 | 230.923 | 66109 | 495.979 | 56.592 | 2.154 | 3.456 |
| 19 | AE4 | 198 | 132 | 75.543 | 235.724 | 41109 | 414.353 | 991.537 | 21.203 | 21.203 |
| 20 | AE4 | 218 | 104 | 23.000 | 107.530 | 254400 | 116.972 | 0.0 | 21.783 | 16.628 |
| 21 | AE4 | 12 | 88 | 48.000 | 0.0 | 30116 | 3616.000 | 0.0 | 21.091 | 38.502 |
| 22 | AE4 | 12 | 88 | 38.500 | 0.0 | 30116 | 3616.000 | 0.0 | 4.051 | 0.027 |
| 23 | AE4 | 12 | 88 | 124.333 | 16.500 | 12112 | 132.000 | 678.000 | 4.051 | 0.027 |
| 24 | AE4 | 12 | 88 | 124.333 | 22.794 | 12112 | 202.000 | 148.350 | 2.407 | 17.866 |
| 25 | AE4 | 12 | 88 | 183.200 | 146.500 | 145500 | 7279.500 | 700.500 | 2.407 | 17.866 |
| 26 | AE4 | 12 | 88 | 178.714 | 101.549 | 35540 | 5077.141 | 3594.657 | 1.428 | 8.261 |
| 27 | AE4 | 12 | 88 | 17.000 | 0.0 | 100 | 10.000 | 0.0 | 1.428 | 0.0 |
| 28 | AE4 | 12 | 88 | 17.500 | 0.0 | 240 | 12.000 | 6.000 | 1.428 | 2.792 |
| 29 | AE4 | 12 | 88 | 124.500 | 0.0 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 30 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 31 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 32 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 33 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 34 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 35 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 36 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 37 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 38 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 39 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 40 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 41 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 42 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 43 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 44 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 45 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 46 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 47 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 48 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 49 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 50 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 51 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 52 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 53 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 54 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 55 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 56 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 57 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 58 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 59 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 60 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 61 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 62 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 63 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 64 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 65 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 66 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 67 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 68 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 69 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 70 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 71 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 72 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 73 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 74 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 75 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 76 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 77 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 78 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 79 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 80 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 81 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 82 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 83 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 84 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 85 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 86 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 87 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 88 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 89 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 90 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 91 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 92 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 93 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 94 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 95 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 96 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 97 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 98 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 99 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |
| 100 | AE4 | 12 | 88 | 121.500 | 181.806 | 173 | 12.000 | 0.0 | 1.428 | 0.0 |

COMPUTER OUTPUT THREE

THE FOLLOWING TABLE IDENTIFIES THE DAILY ARRIVAL OF CARGO AT THE CONTAINER STUFFING STATION BY NO. SHIP., VOLUME, AND WEIGHT.

| DAYS | NO. SHIP | VOLUME | WEIGHT |
|------|----------|--------|--------|
| CAY | 1 | 8 | 4500 |
| CAY | 2 | 450 | 912453 |
| CAY | 3 | 658 | 74329 |
| CAY | 4 | 39 | 5153 |
| CAY | 5 | 669 | 60679 |
| CAY | 6 | 551 | 67676 |
| CAY | 7 | 29 | 2794 |
| CAY | 8 | 7 | 472 |
| CAY | 9 | 440 | 43931 |
| CAY | 10 | 515 | 57393 |
| CAY | 11 | 596 | 70769 |
| CAY | 12 | 637 | 56227 |
| CAY | 13 | 566 | 55764 |
| CAY | 14 | 32 | 2398 |
| CAY | 15 | 0 | 0 |
| CAY | 16 | 821 | 59359 |
| CAY | 17 | 715 | 49880 |
| CAY | 18 | 580 | 63433 |
| CAY | 19 | 504 | 53884 |
| CAY | 20 | 519 | 52183 |
| CAY | 21 | 2 | 252 |
| CAY | 22 | 8 | 2159 |
| CAY | 23 | 548 | 58721 |
| CAY | 24 | 618 | 43916 |
| CAY | 25 | 472 | 42118 |
| CAY | 26 | 524 | 41601 |
| CAY | 27 | 583 | 43156 |
| CAY | 28 | 5 | 625 |
| CAY | 29 | 35 | 1770 |
| CAY | 30 | 458 | 49969 |
| | | | 789230 |

COMPUTER OUTPUT FOUR

[illegible]

THE FOLLOWING TABLE IDENTIFIES THE SHIPMENTS BY THE COMMODITY CODES FOR EACH POD AND CONSIGNEE

CON

[illegible]

THE FOLLOWING TABLE IDENTIFIES THE NUMBER OF DAYS AND THE FREQUENCY IN PERCENT FOR THE VARIOUS INTERVALS OF VOLUME MEASURED IN CUBIC

| PCC | | CCN | THE FOLLOWING TABLE IDENTIFIES THE NUMBER OF DAYS AND THE FREQUENCY IN PERCENT FOR THE VARIOUS INTERVALS OF VOLUME MEASURED IN CU FT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TOTAL RECEIPT TO 15000 OAYS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|--|-----|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------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| | | | 000 IC | 000 IC | 050 IC | 050 IC | 100 IC | 100 IC | 150 IC | 150 IC | 200 IC | 200 IC | 250 IC | 250 IC | 300 IC | 300 IC | 350 IC | 350 IC | 400 IC | 400 IC | 450 IC | 450 IC | 500 IC | 500 IC | 550 IC | 550 IC | 600 IC | 600 IC | 650 IC | 650 IC | 700 IC | 700 IC | 750 IC | 750 IC | 800 IC | 800 IC | 850 IC | 850 IC | 900 IC | 900 IC | 950 IC | 950 IC | | 1000 IC | 1000 IC | 1050 IC | 1050 IC | 1100 IC | 1100 IC | 1150 IC | 1150 IC | 1200 IC | 1200 IC | 1250 IC | 1250 IC | 1300 IC | 1300 IC | 1350 IC | 1350 IC | 1400 IC | 1400 IC | 1450 IC | 1450 IC | 1500 IC | 1500 IC | 1550 IC | 1550 IC | 1600 IC | 1600 IC | 1650 IC | 1650 IC | 1700 IC | 1700 IC | 1750 IC | 1750 IC | 1800 IC | 1800 IC | 1850 IC | 1850 IC | 1900 IC | 1900 IC | 1950 IC | 1950 IC | 2000 IC | 2000 IC | 2050 IC | 2050 IC | 2100 IC | 2100 IC | 2150 IC | 2150 IC | 2200 IC | 2200 IC | 2250 IC | 2250 IC | 2300 IC | 2300 IC | 2350 IC | 2350 IC | 2400 IC | 2400 IC | 2450 IC | 2450 IC | 2500 IC | 2500 IC | 2550 IC | 2550 IC | 2600 IC | 2600 IC | 2650 IC | 2650 IC | 2700 IC | 2700 IC | 2750 IC | 2750 IC | 2800 IC | 2800 IC | 2850 IC | 2850 IC | 2900 IC | 2900 IC | 2950 IC | 2950 IC | 3000 IC | 3000 IC | 3050 IC | 3050 IC | 3100 IC | 3100 IC | 3150 IC | 3150 IC | 3200 IC | 3200 IC | 3250 IC | 3250 IC | 3300 IC | 3300 IC | 3350 IC | 3350 IC | 3400 IC | 3400 IC | 3450 IC | 3450 IC | 3500 IC | 3500 IC | 3550 IC | 3550 IC | 3600 IC | 3600 IC | 3650 IC | 3650 IC | 3700 IC | 3700 IC | 3750 IC | 3750 IC | 3800 IC | 3800 IC | 3850 IC | 3850 IC | 3900 IC | 3900 IC | 3950 IC | 3950 IC | 4000 IC | 4000 IC | 4050 IC | 4050 IC | 4100 IC | 4100 IC | 4150 IC | 4150 IC | 4200 IC | 4200 IC | 4250 IC | 4250 IC | 4300 IC | 4300 IC | 4350 IC | 4350 IC | 4400 IC | 4400 IC | 4450 IC | 4450 IC | 4500 IC | 4500 IC | 4550 IC | 4550 IC | 4600 IC | 4600 IC | 4650 IC | 4650 IC | 4700 IC | 4700 IC | 4750 IC | 4750 IC | 4800 IC | 4800 IC | 4850 IC | 4850 IC | 4900 IC | 4900 IC | 4950 IC | 4950 IC | 5000 IC | 5000 IC | 5050 IC | 5050 IC | 5100 IC | 5100 IC | 5150 IC | 5150 IC | 5200 IC | 5200 IC | 5250 IC | 5250 IC | 5300 IC | 5300 IC | 5350 IC | 5350 IC | 5400 IC | 5400 IC | 5450 IC | 5450 IC | 5500 IC | 5500 IC | 5550 IC | 5550 IC | 5600 IC | 5600 IC | 5650 IC | 5650 IC | 5700 IC | 5700 IC | 5750 IC | 5750 IC | 5800 IC | 5800 IC | 5850 IC | 5850 IC | 5900 IC | 5900 IC | 5950 IC | 5950 IC | 6000 IC | 6000 IC | 6050 IC | 6050 IC | 6100 IC | 6100 IC | 6150 IC | 6150 IC | 6200 IC | 6200 IC | 6250 IC | 6250 IC | 6300 IC | 6300 IC | 6350 IC | 6350 IC | 6400 IC | 6400 IC | 6450 IC | 6450 IC | 6500 IC | 6500 IC | 6550 IC | 6550 IC | 6600 IC | 6600 IC | 6650 IC | 6650 IC | 6700 IC | 6700 IC | 6750 IC | 6750 IC | 6800 IC | 6800 IC | 6850 IC | 6850 IC | 6900 IC | 6900 IC | 6950 IC | 6950 IC | 7000 IC | 7000 IC | 7050 IC | 7050 IC | 7100 IC | 7100 IC | 7150 IC | 7150 IC | 7200 IC | 7200 IC | 7250 IC | 7250 IC | 7300 IC | 7300 IC | 7350 IC | 7350 IC | 7400 IC | 7400 IC | 7450 IC | 7450 IC | 7500 IC | 7500 IC | 7550 IC | 7550 IC | 7600 IC | 7600 IC | 7650 IC | 7650 IC | 7700 IC | 7700 IC | 7750 IC | 7750 IC | 7800 IC | 7800 IC | 7850 IC | 7850 IC | 7900 IC | 7900 IC | 7950 IC | 7950 IC | 8000 IC | 8000 IC | 8050 IC | 8050 IC | 8100 IC | 8100 IC | 8150 IC | 8150 IC | 8200 IC | 8200 IC | 8250 IC | 8250 IC | 8300 IC | 8300 IC | 8350 IC | 8350 IC | 8400 IC | 8400 IC | 8450 IC | 8450 IC | 8500 IC | 8500 IC | 8550 IC | 8550 IC | 8600 IC | 8600 IC | 8650 IC | 8650 IC | 8700 IC | 8700 IC | 8750 IC | 8750 IC | 8800 IC | 8800 IC | 8850 IC | 8850 IC | 8900 IC | 8900 IC | 8950 IC | 8950 IC | 9000 IC | 9000 IC | 9050 IC | 9050 IC | 9100 IC | 9100 IC | 9150 IC | 9150 IC | 9200 IC | 9200 IC | 9250 IC | 9250 IC | 9300 IC | 9300 IC | 9350 IC | 9350 IC | 9400 IC | 9400 IC | 9450 IC | 9450 IC | 9500 IC | 9500 IC | 9550 IC | 9550 IC | 9600 IC | 9600 IC | 9650 IC | 9650 IC | 9700 IC | 9700 IC | 9750 IC | 9750 IC | 9800 IC | 9800 IC | 9850 IC | 9850 IC | 9900 IC | 9900 IC | 9950 IC | 9950 IC | 10000 IC | 10000 IC | 10050 IC | 10050 IC | 10100 IC | 10100 IC | 10150 IC | 10150 IC | 10200 IC | 10200 IC | 10250 IC | 10250 IC | 10300 IC | 10300 IC | 10350 IC | 10350 IC | 10400 IC | 10400 IC | 10450 IC | 10450 IC | 10500 IC | 10500 IC | 10550 IC | 10550 IC | 10600 IC | 10600 IC | 10650 IC | 10650 IC | 10700 IC | 10700 IC | 10750 IC | 10750 IC | 10800 IC | 10800 IC | 10850 IC | 10850 IC | 10900 IC | 10900 IC | 10950 IC | 10950 IC | 11000 IC | 11000 IC | 11050 IC | 11050 IC | 11100 IC | 11100 IC | 11150 IC | 11150 IC | 11200 IC | 11200 IC | 11250 IC | 11250 IC | 11300 IC | 11300 IC | 11350 IC | 11350 IC | 11400 IC | 11400 IC | 11450 IC | 11450 IC | 11500 IC | 11500 IC | 11550 IC | 11550 IC | 11600 IC | 11600 IC | 11650 IC | 11650 IC | 11700 IC | 11700 IC | 11750 IC | 11750 IC | 11800 IC | 11800 IC | 11850 IC | 11850 IC | 11900 IC | 11900 IC | 11950 IC | 11950 IC | 12000 IC | 12000 IC | 12050 IC | 12050 IC | 12100 IC | 12100 IC | 12150 IC | 12150 IC | 12200 IC | 12200 IC | 12250 IC | 12250 IC | 12300 IC | 12300 IC | 12350 IC | 12350 IC | 12400 IC | 12400 IC | 12450 IC | 12450 IC | 12500 IC | 12500 IC | 12550 IC | 12550 IC | 12600 IC | 12600 IC | 12650 IC | 12650 IC | 12700 IC | 12700 IC | 12750 IC | 12750 IC | 12800 IC | 12800 IC | 12850 IC | 12850 IC | 12900 IC | 12900 IC | 12950 IC | 12950 IC | 13000 IC | 13000 IC | 13050 IC | 13050 IC | 13100 IC | 13100 IC | 13150 IC | 13150 IC | 13200 IC | 13200 IC | 13250 IC | 13250 IC | 13300 IC | 13300 IC | 13350 IC | 13350 IC | 13400 IC | 13400 IC | 13450 IC | 13450 IC | 13500 IC | 13500 IC | 13550 IC | 13550 IC | 13600 IC | 13600 IC | 13650 IC | 13650 IC | 13700 IC | 13700 IC | 13750 IC | 13750 IC | 13800 IC | 13800 IC | 13850 IC | 13850 IC | 13900 IC | 13900 IC | 13950 IC | 13950 IC | 14000 IC | 14000 IC | 14050 IC | 14050 IC | 14100 IC | 14100 IC | 14150 IC | 14150 IC | 14200 IC | 14200 IC | 14250 IC | 14250 IC | 14300 IC | 14300 IC | 14350 IC | 14350 IC | 14400 IC | 14400 IC | 14450 IC | 14450 IC | 14500 IC | 14500 IC | 14550 IC | 14550 IC | 14600 IC | 14600 IC | 14650 IC | 14650 IC | 14700 IC | 14700 IC | 14750 IC | 14750 IC | 14800 IC | 14800 IC | 14850 IC | 14850 IC | 14900 IC | 14900 IC | 14950 IC | 14950 IC | 15000 IC | 15000 IC | 15050 IC | 15050 IC | 15100 IC | 15100 IC | 15150 IC | 15150 IC | 15200 IC | 15200 IC | 15250 IC | 15250 IC | 15300 IC | 15300 IC | 15350 IC | 15350 IC | 15400 IC | 15400 IC | 15450 IC | 15450 IC | 15500 IC | 15500 IC | 15550 IC | 15550 IC | 15600 IC | 15600 IC | 15650 IC | 15650 IC | 15700 IC | 15700 IC | 15750 IC | 15750 IC | 15800 IC | 15800 IC | 15850 IC | 15850 IC | 15900 IC | 15900 IC | 15950 IC | 15950 IC | 16000 IC | 16000 IC | 16050 IC | 16050 IC | 16100 IC | 16100 IC | 16150 IC | 16150 IC | 16200 IC | 16200 IC | 16250 IC | 16250 IC | 16300 IC | 16300 IC | 16350 IC | 16350 IC | 16400 IC | 16400 IC | 16450 IC | 16450 IC | 16500 IC | 16500 IC | 16550 IC | 16550 IC | 16600 IC | 16600 IC | 16650 IC | 16650 IC | 16700 IC | 16700 IC | 16750 IC | 16750 IC | 16800 IC | 16800 IC | 16850 IC | 16850 IC | 16900 IC | 16900 IC | 16950 IC | 16950 IC | 17000 IC | 17000 IC | 17050 IC | 17050 IC | 17100 IC | 17100 IC | 17150 IC | 17150 IC | 17200 IC | 17200 IC | 17250 IC | 17250 IC | 17300 IC | 17300 IC | 17350 IC | 17350 IC | 17400 IC | 17400 IC | 17450 IC | 17450 IC | 17500 IC | 17500 IC | 17550 IC | 17550 IC | 17600 IC | 17600 IC | 17650 IC | 17650 IC | 17700 IC | 17700 IC | 17750 IC | 17750 IC | 17800 IC | 17800 IC | 17850 IC | 17850 IC | 17900 IC | 17900 IC | 17950 IC | 17950 IC | 18000 IC | 18000 IC | 18050 IC | 18050 IC | 18100 IC | 18100 IC | 18150 IC | 18150 IC | 18200 IC | 18200 IC | 18250 IC | 18250 IC | 18300 IC | 18300 IC | 18350 IC | 18350 IC | 18400 IC | 18400 IC | 18450 IC | 18450 IC | 18500 IC | 18500 IC | 18550 IC | 18550 IC | 18600 IC | 18600 IC | 18650 IC | 18650 IC | 18700 IC | 18700 IC | 18750 IC | 18750 IC | 18800 IC | 18800 IC | 18850 IC | 18850 IC | 18900 IC | 18900 IC | 18950 IC | 18950 IC | 19000 IC | 19000 IC | 19050 IC | 19050 IC | 19100 IC | 19100 IC | 19150 IC | 19150 IC | 19200 IC | 19200 IC | 19250 IC | 19250 IC | 19300 IC | 19300 IC | 19350 IC | 19350 IC | 19400 IC | 19400 IC | 19450 IC | 19450 IC | 19500 IC | 19500 IC | 19550 IC | 19550 IC | 19600 IC | 19600 IC | 19650 IC | 19650 IC | 19700 IC | 19700 IC | 19750 IC | 19750 IC | 19800 IC | 19800 IC | 19850 IC | 19850 IC | 19900 IC | 19900 IC | 19950 IC | 19950 IC | 20000 IC | 20000 IC | 20050 IC | 20050 IC | 20100 IC | 20100 IC | 20150 IC | 20150 IC | 20200 IC | 20200 IC | 20250 IC | 20250 IC | 20300 IC | 20300 IC | 20350 IC | 20350 IC | 20400 IC | 20400 IC | 20450 IC | 20450 IC | 20500 IC | 20500 IC | 20550 IC | 20550 IC | 20600 IC | 20600 IC | 20650 IC | 20650 IC | 20700 IC | 20700 IC | 20750 IC | 20750 IC | 20800 IC | 20800 IC | 20850 IC | 20850 IC | 20900 IC | 20900 IC | 20950 IC | 20950 IC | 21000 IC | 21000 IC | 21050 IC | 21050 IC | 21100 IC | 21100 IC | 21150 IC | 21150 IC | 21200 IC | 21200 IC | 21250 IC | 21250 IC | 21300 IC | 21300 IC | 21350 IC | 21350 IC | 21400 IC | 21400 IC | 21450 IC | 21450 IC | 21500 IC | 21500 IC | 21550 IC | 21550 IC | 21600 IC | 21600 IC | 21650 IC | 21650 IC | 21700 IC | 21700 IC | 21750 IC | 21750 IC | 21800 IC | 21800 IC | 21850 IC | 21850 IC | 21900 IC | 21900 IC | 21950 IC | 21950 IC | 22000 IC | 22000 IC | 22050 IC | 22050 IC | 22100 IC | 22100 IC | 22150 IC | 22150 IC | 22200 IC | 22200 IC | 22250 IC | 22250 IC | 22300 IC | 22300 IC | 22350 IC | 22350 IC | 22400 IC | 22400 IC | 22450 IC | 22450 IC | 22500 IC | 22500 IC | 22550 IC | 22550 IC | 22600 IC | 22600 IC | 22650 IC | 22650 IC | 22700 IC | 22700 IC | 22750 IC | 22750 IC | 22800 IC | 22800 IC | 22850 IC | 22850 IC | 22900 IC | 22900 IC | 22950 IC | 22950 IC | 23000 IC | 23000 IC | 23050 IC | 23050 IC | 23100 IC | 23100 IC | 23150 IC | 23150 IC | 23200 IC | 23200 IC | 23250 IC | 23250 IC | 23300 IC | 23300 IC | 23350 IC | 23350 IC | 23400 IC | 23400 IC | 23450 IC | 23450 IC | 23500 IC | 23500 IC | 23550 IC | 23550 IC | 23600 IC | 23600 IC | 23650 IC | 23650 IC | 23700 IC | 23700 IC | 23750 IC | 23750 IC | 23800 IC | 23800 IC | 23850 IC | 23850 IC | 23900 IC | 23900 IC | 23950 IC | 23950 IC | 24000 IC | 24000 IC | 24050 IC | 24050 IC | 24100 IC | 24100 IC | 24150 IC | 24150 IC | 24200 IC | 24200 IC | 24250 IC | 24250 IC | 24300 IC | 24300 IC | 24350 IC |

COMPUTER OUTPUT SIX-2

THE FOLLOWING TABLE IDENTIFIES THE NUMBER OF DAYS AND THE FREQUENCY IN PERCENT FOR THE VARIOUS INTERVALS OF WEIGHT MEASURED IN PDS.

[illegible][illegible]

COMPUTER OUTPUT SEVEN-1

THE FOLLOWING TABLES IDENTIFY THE VARIOUS CARGO PARAMETERS FOR THE THIRTEEN PCOS BASED ON A 30-DAY INCREMENT BY CONTAINER TYPE

| | | | | | | | | |
|--------------------------------|---------------------------------|-------------------------------------|--|---|--|---|---------------------------------------|---|
| CONTAINER TYPE 10 11 | NO. CONTAINERS 38 103 | AVE. AGE 4.988 12.509 | STD. DEV. AGE 4.823 12.328 | PCO- 1 MONTH- 11 | | STO. DEV. CUBE UTIL. 18.870 10.816 | NO. SINGLE CCN. CCNT. 35 95 | SINGLE CON. PROP 0.921 0.961 |
| | | | | AVE. CUBE UTIL. 73.500 83.045 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 4 | NO. CONTAINERS 11 3 | AVE. AGE 16.273 9.984 | STD. DEV. AGE 14.314 7.763 | PCO- 2 MONTH- 11 | | STO. DEV. CUBE UTIL. 15.445 6.976 | NO. SINGLE CCN. CCNT. 8 0 | SINGLE CON. PROP 0.727 0.0 |
| | | | | AVE. CUBE UTIL. 75.000 59.000 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 | NO. CONTAINERS 7 | AVE. AGE 11.464 | STD. DEV. AGE 9.971 | PCO- 3 MONTH- 11 | | STO. DEV. CUBE UTIL. 16.291 | NO. SINGLE CCN. CCNT. 4 | SINGLE CON. PROP 0.571 |
| | | | | AVE. CUBE UTIL. 76.425 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 8 10 | NO. CONTAINERS 22 2 12 | AVE. AGE 5.240 1.000 6.128 | STD. DEV. AGE 4.992 0.661 5.686 | PCO- 4 MONTH- 11 | | STO. DEV. CUBE UTIL. 11.947 9.000 11.243 | NO. SINGLE CCN. CCNT. 20 1 9 | SINGLE CON. PROP 0.509 0.500 0.750 |
| | | | | AVE. CUBE UTIL. 81.000 59.000 80.417 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 13 16 | NO. CONTAINERS 5 20 | AVE. AGE 5.204 10.105 | STD. DEV. AGE 4.362 9.734 | PCO- 5 MONTH- 11 | | STO. DEV. CUBE UTIL. 16.354 14.820 | NO. SINGLE CCN. CCNT. 5 17 | SINGLE CON. PROP 1.000 0.850 |
| | | | | AVE. CUBE UTIL. 70.400 74.850 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 10 | NO. CONTAINERS 43 29 | AVE. AGE 8.690 5.307 | STD. DEV. AGE 8.361 5.105 | PCO- 6 MONTH- 11 | | STO. DEV. CUBE UTIL. 12.132 16.000 | NO. SINGLE CCN. CCNT. 38 23 | SINGLE CON. PROP 0.884 0.793 |
| | | | | AVE. CUBE UTIL. 80.442 74.931 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 8 10 | NO. CONTAINERS 1 5 10 | AVE. AGE 1.000 5.487 3.535 | STD. DEV. AGE 0.0 4.950 3.241 | PCO- 7 MONTH- 11 | | STO. DEV. CUBE UTIL. 0.0 14.281 13.609 | NO. SINGLE CCN. CCNT. 1 8 10 | SINGLE CON. PROP 1.000 0.889 1.000 |
| | | | | AVE. CUBE UTIL. 90.000 73.222 80.000 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 16 10 | NO. CONTAINERS 3 2 | AVE. AGE 7.823 9.420 | STD. DEV. AGE 7.102 6.459 | PCO- 8 MONTH- 11 | | STO. DEV. CUBE UTIL. 9.319 3.500 | NO. SINGLE CCN. CCNT. 6 1 | SINGLE CON. PROP 0.667 0.500 |
| | | | | AVE. CUBE UTIL. 70.778 79.500 | | | | |
| | | | | | | | | |

COMPUTER OUTPUT SEVEN-2

THE FOLLOWING TABLES IDENTIFY THE VARIOUS CARGO PARAMETERS FOR THE THIRTEEN POOS BASED ON A 30-DAY INCREMENT BY CONTAINER TYPE

| | | | | | | | | | |
|----------------------------|----------------------------|------------------------------|------------------|--|----------------------------------|-------------------------------------|--|-----------------------------------|------------------------------------|
| CONTAINER TYPE 10 11 | NO. CONTAINERS 38 64 | AVE. AGE 9.170 5.887 | PGD- 1 MONTH- 21 | | STO. DEV. AGE 7.857 5.770 | AVE. CUBE UTIL. 73.658 81.047 | STO. DEV. CUBE UTIL. 14.916 9.595 | NO. SINGLE CCN. CONT. 27 64 | SINGLE CON. PRCP 0.711 1.000 |
| | | | | | | | | | |
| CONTAINER TYPE 3 4 | NO. CONTAINERS 7 7 | AVE. AGE 16.000 10.897 | PGD- 2 MONTH- 21 | | STO. DEV. AGE 6.829 9.564 | AVE. CUBE UTIL. 61.500 61.286 | STO. DEV. CUBE UTIL. 8.500 12.418 | NO. SINGLE CCN. CONT. 2 3 | SINGLE CON. PRCP 1.000 0.714 |
| | | | | | | | | | |
| CONTAINER TYPE 3 | NO. CONTAINERS 11 | AVE. AGE 13.629 | PGD- 3 MONTH- 21 | | STO. DEV. AGE 12.247 | AVE. CUBE UTIL. 77.636 | STO. DEV. CUBE UTIL. 11.388 | NO. SINGLE CCN. CONT. 7 | SINGLE CON. PRCP 0.636 |
| | | | | | | | | | |
| CONTAINER TYPE 3 10 | NO. CONTAINERS 40 33 | AVE. AGE 5.024 6.182 | PGD- 4 MONTH- 21 | | STO. DEV. AGE 4.905 5.961 | AVE. CUBE UTIL. 82.300 83.257 | STO. DEV. CUBE UTIL. 10.412 10.729 | NO. SINGLE CCN. CONT. 32 32 | SINGLE CON. PRCP 0.825 0.943 |
| | | | | | | | | | |
| CONTAINER TYPE 13 16 | NO. CONTAINERS 15 10 | AVE. AGE 7.955 8.101 | PGD- 5 MONTH- 21 | | STO. DEV. AGE 7.447 7.378 | AVE. CUBE UTIL. 80.133 77.700 | STO. DEV. CUBE UTIL. 13.913 12.578 | NO. SINGLE CCN. CONT. 12 5 | SINGLE CON. PRCP 0.800 0.900 |
| | | | | | | | | | |
| CONTAINER TYPE 3 10 | NO. CONTAINERS 22 22 | AVE. AGE 13.948 8.141 | PGD- 6 MONTH- 21 | | STO. DEV. AGE 12.435 7.880 | AVE. CUBE UTIL. 78.788 81.880 | STO. DEV. CUBE UTIL. 13.427 12.307 | NO. SINGLE CCN. CONT. 48 23 | SINGLE CON. PRCP 0.923 0.920 |
| | | | | | | | | | |
| CONTAINER TYPE 8 | NO. CONTAINERS 67 | AVE. AGE 14.436 | PGD- 7 MONTH- 21 | | STO. DEV. AGE 14.104 | AVE. CUBE UTIL. 81.776 | STO. DEV. CUBE UTIL. 12.422 | NO. SINGLE CCN. CONT. 63 | SINGLE CON. PRCP 0.940 |
| | | | | | | | | | |
| CONTAINER TYPE 8 10 | NO. CONTAINERS 2 1 | AVE. AGE 10.636 5.000 | PGD- 8 MONTH- 21 | | STO. DEV. AGE 6.984 0.0 | AVE. CUBE UTIL. 83.500 68.000 | STO. DEV. CUBE UTIL. 5.500 0.0 | NO. SINGLE CCN. CONT. 1 0 | SINGLE CON. PRCP 0.500 0.0 |
| | | | | | | | | | |

COMPUTER OUTPUT SEVEN-3

THE FOLLOWING TABLES IDENTIFY THE VARIOUS CARGO PARAMETERS FOR THE THIRTEEN PODS BY CONTAINER TYPE FOR THE TWO-YEAR PERIOD

| | | | | | | | | |
|---------------------------------|--------------------------------------|-------------------------------------|--|--|--|--|---|---|
| CONTAINER TYPE 10 11 | NO. CONTAINERS 1009 1783 | AVE. AGE 7.610 10.600 | STD. DEV. AGE 7.599 10.591 | POD- 1 | | STD. DEV. CUBE UTIL. 15.870 13.043 | NO. SINGLE CCN. CCNT. 875 1721 | SINGLE CON. PROP 0.870 0.965 |
| | | | | AVE. CUBE UTIL. 74.769 80.307 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 4 | NO. CONTAINERS 157 105 | AVE. AGE 16.912 16.719 | STD. DEV. AGE 15.876 16.521 | POD- 2 | | STD. DEV. CUBE UTIL. 13.328 12.813 | NO. SINGLE CCN. CCNT. 122 65 | SINGLE CON. PROP 0.777 0.633 |
| | | | | AVE. CUBE UTIL. 75.401 72.605 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 8 | NO. CONTAINERS 226 11 | AVE. AGE 11.328 19.000 | STD. DEV. AGE 11.304 15.256 | POD- 3 | | STD. DEV. CUBE UTIL. 13.464 12.527 | NO. SINGLE CCN. CCNT. 145 7 | SINGLE CON. PROP 0.659 0.636 |
| | | | | AVE. CUBE UTIL. 73.549 68.273 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 8 10 | NO. CONTAINERS 847 357 710 | AVE. AGE 7.098 7.195 7.920 | STD. DEV. AGE 7.080 7.112 7.508 | POD- 4 | | STD. DEV. CUBE UTIL. 10.860 10.553 12.253 | NO. SINGLE CCN. CCNT. 788 372 654 | SINGLE CON. PROP 0.930 0.937 0.921 |
| | | | | AVE. CUBE UTIL. 81.372 81.703 82.096 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 8 13 16 | NO. CONTAINERS 129 318 301 | AVE. AGE 8.320 9.353 8.529 | STD. DEV. AGE 8.431 9.518 8.500 | POD- 5 | | STD. DEV. CUBE UTIL. 11.500 13.504 15.052 | NO. SINGLE CCN. CCNT. 121 280 262 | SINGLE CON. PROP 0.938 0.881 0.870 |
| | | | | AVE. CUBE UTIL. 79.233 78.255 76.5375 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 10 11 | NO. CONTAINERS 1280 577 267 | AVE. AGE 8.196 8.843 6.323 | STD. DEV. AGE 8.184 8.634 6.261 | POD- 6 | | STD. DEV. CUBE UTIL. 11.137 14.957 12.396 | NO. SINGLE CCN. CCNT. 1200 520 249 | SINGLE CON. PROP 0.938 0.901 0.933 |
| | | | | AVE. CUBE UTIL. 81.161 77.830 79.730 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 3 8 10 | NO. CONTAINERS 776 922 155 | AVE. AGE 5.972 9.395 6.040 | STD. DEV. AGE 9.952 7.378 5.971 | POD- 7 | | STD. DEV. CUBE UTIL. 13.334 13.815 18.254 | NO. SINGLE CCN. CCNT. 740 876 152 | SINGLE CON. PROP 0.954 0.950 0.956 |
| | | | | AVE. CUBE UTIL. 80.657 79.505 72.006 | | | | |
| | | | | | | | | |
| CONTAINER TYPE 8 10 | NO. CONTAINERS 191 148 | AVE. AGE 14.175 11.451 | STD. DEV. AGE 14.096 11.200 | POD- 8 | | STD. DEV. CUBE UTIL. 11.285 14.703 | NO. SINGLE CCN. CCNT. 148 24 | SINGLE CON. PROP 0.775 0.500 |
| | | | | AVE. CUBE UTIL. 78.435 71.229 | | | | |
| | | | | | | | | |

COMPUTER OUTPUT EIGHT




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14 FORMAT(1X,A3,3X,A4,A2,19(2X,I3),2(3X,I3),3X,I4)
15 FORMAT(1X,A3,3X,A4,A2,16(2X,I3),5(3X,I3),3X,I4)
16 FORMAT(1X,A3,3X,A4,A2,21(2X,I3),3X,I4)
17 FORMAT(1X,I4,2X,A3,2X,A4,A2,5X,I4,4X,I6,3X,F9.3,6X,F8.3,5X,I8,5X,F
18 19.3,8X,F9.3,4X,F7.3,6X,F7.3)
19 FORMAT(1X,CONSIGNEE PERFORMANCE)
19 1X,NO. POD CON NO. SHIP. TOT. VOL. AVE. VOL. STD.
1X,DEV. VOL. TOT. WGT. AVE. WGT. STD. DEV. WGT. AVE. DEN. STD.
2X,DEV. DEN.
C ESTABLISH THE INTEGER VALUE AT WHICH CUTS ARE MADE FOR FREQUENCY DIST.
C FOR VOLUME, WEIGHT, AND DENSITY.
VCUT(1)=2
VCUT(2)=4
VCUT(3)=6
VCUT(4)=8
VCUT(5)=10
VCUT(6)=14
VCUT(7)=20
VCUT(8)=30
VCUT(9)=40
VCUT(10)=50
VCUT(11)=70
VCUT(12)=90
VCUT(13)=120
VCUT(14)=150
VCUT(15)=200
VCUT(16)=400
VCUT(17)=600
VCUT(18)=800
VCUT(19)=1000
VCUT(20)=2000
WCUT(1)=10
WCUT(2)=25
WCUT(3)=50
WCUT(4)=75
WCUT(5)=100
WCUT(6)=150
WCUT(7)=250
WCUT(8)=400
WCUT(9)=600
WCUT(10)=800
WCUT(11)=1000
WCUT(12)=1500
WCUT(13)=2000
WCUT(14)=4000
WCUT(15)=7000
WCUT(16)=10000

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```

WCUT(17)=14000
WCUT(18)=18000
WCUT(19)=25000
WCUT(20)=35000
DCUT(1)=4
DCUT(2)=7
DCUT(3)=10
DCUT(4)=13
DCUT(5)=16
DCUT(6)=19
DCUT(7)=22
DCUT(8)=25
DCUT(9)=28
DCUT(10)=31
DCUT(11)=34
DCUT(12)=37
DCUT(13)=40
DCUT(14)=43
DCUT(15)=46
DCUT(16)=49
DCUT(17)=52
DCUT(18)=55
DCUT(19)=58
DCUT(20)=61
ENDFLG=1
LCN1=0
LCN2=0
N=0

```

```

C READ A CONSIGEE SHIPMENT FROM DATA CELL
20 READ(13,1,END=27)POD,CN1,CN2,EHC,CUBE,WGHT,PCS,DT,CC,TAC
C IF((LCN1.NE.CN1).OR.(LCN2.NE.CN2));GO TO 21
C TABULATE THE FREQUENCY OF VOLUME.
23 VAL=CUBE
DO 24 I=1,20
IF(VAL.LT.VCUT(I))GO TO 28
C CONTINUE
24 VFREQ(I+1)=VFREQ(I)+1
GO TO 30
28 VFREQ(I)=VFREQ(I)+1
C COMPUTE THE TOTAL VOLUME FOR EACH CCNSIGNEE.
30 TVOL=TVOL+CUBE
C COMPUTE THE TOTAL SQUARED VOLUME FOR EACH CCNSIGNEE.
TSVOL=TSVOL+CUBE**2
C TABULATE THE FREQUENCY OF WEIGHT.
VAL=WGHT
DO 40 I=1,20
IF(VAL.LT.WCUT(I))GO TO 50
C CONTINUE
40 CONTINUE

```



```

WFREQ(I+1)=WFREQ(I+1)+1
GO TO 60
50 WFREQ(I)=WFREQ(I)+1
C COMPUTE THE TOTAL WEIGHT FOR EACH CONSIGNEE
60 TWGHT=TWGHT+WGHT
C COMPUTE THE TOTAL SQUARED WEIGHT FOR EACH CONSIGNEE
TSWGHT=TSWGHT+WGHT**2
C CHANGE CUBE FROM INTEGER TO REAL
XCUBE=CUBE
C CHANGE WEIGHT FROM INTEGER TO REAL
XWGHT=WGHT
C COMPUTE THE DENSITY OF SHIPMENT.
XDEN=XWGHT/XCUBE
VAL=XDEN
C TABULATE THE FREQUENCY OF DENSITY.
DO 70 I=1,20
IF (VAL.LT.DCUT(I))GO TO 80
70 CONTINUE
DFREQ(I+1)=DFREQ(I)+1
GO TO 90
80 DFREQ(I)=DFREQ(I)+1
C COMPUTE THE TOTAL DENSITY OF A CONSIGNEE
90 TDEN=TDEN+XDEN
C COMPUTE THE TOTAL SQUARED DENSITY FOR A CONSIGNEE
TSDEN=TSDEN+XDEN**2
C KEEP TRACK OF HOW MANY SHIPMENTS GO TO EACH CONSIGNEE.
NSHIP=NSHIP+1
GO TO 20
C ESTABLISH THAT THIS IS FIRST SHIPMENT FOR A NEW CONSIGNEE.
21 IF (LCN1.EQ.0)GO TO 29
C COMPUTE THE AVERAGE VOLUME FOR A CONSIGNEE.
25 XTMP=FLQAT(NSHIP)
XAVEV=TVOL/XTMP
C COMPUTE THE STANDARD DEVIATION IN VOLUME
XSDEVV=TSVOL-(TVOL**2)/XTMP
XSDEVV=XSEVV/XTMP
XSDEVV=ABS(XSDEVV)
XSDEVV=SQRT(XSDEVV)
C COMPUTE THE AVERAGE WEIGHT FOR A CONSIGNEE
XAVEW=TWGHT/XTMP
C COMPUTE THE STANDARD DEVIATION IN WEIGHT
XSDEVW=TSWGHT-(TWGHT**2)/XTMP
XSDEVW=XSEVW/XTMP
XSDEVW=ABS(XSDEVW)
XSDEVW=SQRT(XSDEVW)
C COMPUTE THE AVERAGE DENSITY FOR A CONSIGNEE
XAVED=TDEN/XTMP
C COMPUTE THE STANDARD DEVIATION IN DENSITY

```



```

XSDEVD=TSDEN-(TDEN**2)/XTMP
XSDEVD=XSDEVD/XTMP
XSDEVD=ABS(XSDEVD)
XSDEVD=SQR(XSDEVD)
C STORE THE VOLUME FREQUENCY FOR PRINTOUT AT END OF PROGRAM.
DC 100 I=1,21
SVFREQ(N,I)=VFREQ(I)
100 CONTINUE
C STORE THE WEIGHT FREQUENCY FOR PRINTOUT AT END OF PROGRAM.
DC 150 I=1,21
SWFREQ(N,I)=WFREQ(I)
150 CONTINUE
C STORE THE DENSITY FREQUENCY FOR PRINTOUT AT THE END OF THE PROGRAM
DC 170 I=1,21
SDFREQ(N,I)=DFREQ(I)
170 CONTINUE
C STORE THE TOTAL NUMBER OF SHIPMENTS FOR EACH CONSIGNEE
SNSHIP(N)=NSHIP
C STORE TOTAL VOLUME FOR PRINTOUT AT END OF PROGRAM.
STVOL(N)=TVOL
C STORE AVERAGE VOLUME FOR PRINTOUT AT END OF PROGRAM.
XSAVEV(N)=XAVEV
C STORE STANDARD DEVIATION CF VOLUME FOR PRINTOUT AT END OF PROGRAM.
SDEVV(N)=XSDEVV
C STORE TOTAL WEIGHT FOR PRINTOUT AT END OF PROGRAM.
STWGT(N)=TWGHT
C STORE AVERAGE WEIGHT FOR PRINTOUT AT END OF PROGRAM.
XAVEM(N)=XAVEM
C STORE STANDARD DEVIATION OF WEIGHT FOR PRINTOUT AT END OF PROGRAM.
SDEW(N)=XSDEW
C STORE AVERAGE DENSITY FOR PRINTOUT AT END OF PROGRAM.
XAVED(N)=XAVED
C STORE STANDARD DEVIATION OF DENSITY FOR PRINTOUT AT END OF PROGRAM.
SDEV(N)=XSDEV
C SET ALL COMPUTATIONAL ELEMENTS TO ZERO TO PROCESS NEXT CONSIGNEE.
IF(ENDFLG.EQ.2)GO TO 31
29 TVOL=0
TSVOL=0
TWGHT=0
TSWGT=0
TDEN=0
TSDEN=0
NSHIP=0
C SET ALL FREQUENCY COUNTERS BACK TO ZERO TO PROCESS NEXT CONSIGNEE.
DC 200 I=1,21
VFREQ(I)=0
200 CONTINUE
DC 210 I=1,21

```



```

W FREQ(I)=0
210 CONTINUE
DC 220 I=1,21
W FREQ(I)=0
220 CONTINUE
LCN1=CN1
LCN2=CN2
C INCREMENT COUNTER FOR NEW CONSIGNEE
N=N+1
C STORE POD AND CN1,CN2 FOR PRINTOUT AT END OF PROGRAM
SPCD(N)=POD
SCN1(N)=CN1
SCN2(N)=CN2
C START TO TABULATE THE FREQUENCIES FOR NEXT CONSIGNEE.
GO TO 23
27 ENDFLG=2
IF(ENDFLG.EQ.2)GO TO 25
C WRITE OUT THE FREQUENCY DATA FOR VOLUME BY CONSIGNEE
31 WRITE(6,2)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED VOLUMES.
WRITE(6,5)
WRITE(6,6)
WRITE(6,7)
C BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
WRITE(6,1)
WRITE(6,1)
DO 300 N=1,1822
WRITE(6,14)SPOD(N),SCN1(N),SCN2(N),(SVFREQ(N,I),I=1,21),SNSHIP(N)
300 CONTINUE
C WRITE OUT FREQUENCY DATA FOR WEIGHT BY CONSIGNEE.
WRITE(6,3)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED WEIGHTS.
WRITE(6,8)
WRITE(6,9)
WRITE(6,10)
C BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
WRITE(6,1)
WRITE(6,1)
DO 350 N=1,1822
WRITE(6,15)SPOD(N),SCN1(N),SCN2(N),(SWFREQ(N,I),I=1,21),SNSHIP(N)
350 CONTINUE
C WRITE OUT FREQUENCY DATA FOR DENSITY BY CONSIGNEE.
WRITE(6,4)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED DENSITIES.
WRITE(6,11)
WRITE(6,12)
WRITE(6,13)
C BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE

```



```

WRITE(6,1)
WRITE(6,1)
DC 400 N=1,1822
WRITE(6,16){SPOD(N),SCN1(N),SCN2(N),(SDFREQ(N,I),I=1,21),SNSHIP(N)
C CONTINUE FOR CONSOLIDATED INFORMATION FOR EACH CONSIGNEE.
C PRINT HEADING FOR CONSOLIDATED INFORMATION FOR EACH CONSIGNEE.
C PRINT REQUIRED COLUMN HEADINGS FOR CONSOLIDATED INFORMATION.
C PRINT WRITE(6,19)
C BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
C WRITE(6,1)
C WRITE(6,1)
C WRITE OUT CONSOLIDATED DATA FOR EACH CONSIGNEE.
DC 450 N=1,1822
WRITE(6,17){N,SPOD(N),SCN1(N),SCN2(N),SNSHIP(N),STVOL(N),SXAVEV(N),
i SSDEVV(N),STWGT(N),SXAVEW(N),SSDEVW(N),SXAVED(N),SSDEVV(N)
C CONTINUE
450 STOP
END

```


COMPUTER PROGRAM TWO

[illegible]


```

14 FORMAT(1X,13,3X,A3,3X,19(2X,I3),2(3X,I3),3X,I4)
15 FORMAT(1X,13,3X,A3,3X,16(2X,I3),5(3X,I3),3X,I4)
16 FORMAT(1X,13,3X,A3,3X,2(2X,I3),1X,I4,18(2X,I3),2X,I4)
17 FCRMAT(1X,14,2X,A3,3X,I4,3X,I7,3X,F10.3,6X,F8.3,5X,I8,5X,F10.3,7X,
18 F9.3,4X,F7.3,6X,F7.3)
19 FORMAT('1
1) TABLE OF POD PERFORMANCE')
19 FCRMAT('0 NO. POD NO. SHIP. TOT.VOL. AVE.VOL. STD.DEV.VOL.
1) TOT.WGHT. AVE.WGHT. STD.DEV.WGHT. AVE.DEN. STD.DEV.DEN.
2)
C ESTABLISH THE INTEGER VALUE AT WHICH CUTS ARE MADE FOR FREQUENCY DIST.
C FCR VOLUME, WEIGHT, AND DENSITY.
VCUT(1)=2
VCUT(2)=4
VCUT(3)=6
VCUT(4)=8
VCUT(5)=10
VCUT(6)=14
VCUT(7)=20
VCUT(8)=30
VCUT(9)=40
VCUT(10)=50
VCUT(11)=70
VCUT(12)=90
VCUT(13)=120
VCUT(14)=150
VCUT(15)=200
VCUT(16)=400
VCUT(17)=600
VCUT(18)=800
VCUT(19)=1000
VCUT(20)=2000
WCUT(1)=10
WCUT(2)=25
WCUT(3)=50
WCUT(4)=75
WCUT(5)=100
WCUT(6)=150
WCUT(7)=250
WCUT(8)=400
WCUT(9)=600
WCUT(10)=800
WCUT(11)=1000
WCUT(12)=1500
WCUT(13)=2000
WCUT(14)=4000
WCUT(15)=7000
WCUT(16)=10000

```



```

WCUT(17)=14000
WCUT(18)=18000
WCUT(19)=25000
WCUT(20)=35000
DCUT(1)=4
DCUT(2)=7
DCUT(3)=10
DCUT(4)=13
DCUT(5)=16
DCUT(6)=19
DCUT(7)=22
DCUT(8)=25
DCUT(9)=28
DCUT(10)=31
DCUT(11)=34
DCUT(12)=37
DCUT(13)=40
DCUT(14)=43
DCUT(15)=46
DCUT(16)=49
DCUT(17)=52
DCUT(18)=55
DCUT(19)=58
DCUT(20)=61
ENDFLG=1
LPOD=0
N=0

```

```

C READ A CONSIGEE SHIPMENT FROM DATA CELL
20 READ(13,1,END=27)POD,CN1,CN2,EHC,CUBE,WGHT,PCS,DT,CC,TAC
IF(LPOD.NE.POD)GO TO 21
C TABULATE THE FREQUENCY OF VOLUME.
23 VAL=CUBE
DC 24 I=1,20
IF(VAL.LT.VCUT(I))GO TO 28
24 CONTINUE
VFREQ(I+1)=VFREQ(I)+1
GO TO 30
28 VFREQ(I)=VFREQ(I)+1
C CCMPUTE THE TOTAL VOLUME FOR EACH POD
30 TVOL=TVOL+CUBE
C CCMPUTE THE TOTAL SQUARED VOLUME FOR EACH POD.
TSVOL=TSVOL+CUBE**2
C TABULATE THE FREQUENCY OF WEIGHT.
VAL=WGHT
DC 40 I=1,20
IF(VAL.LT.WCUT(I))GO TO 50
40 CONTINUE
WFREQ(I+1)=WFREQ(I)+1

```



```

GC TO 60
50 WREQ(I)=WREQ(I)+1
C COMPUTE THE TOTAL WEIGHT FOR EACH POD.
60 TWGHT=TWGHT+WGHT
C COMPUTE THE TOTAL SQUARED WEIGHT FOR EACH POD.
T SWGHT=T SWGHT+WGHT**2
C CHANGE CUBE FROM INTEGER TO REAL
XCUBE=CUBE
C CHANGE WEIGHT FROM INTEGER TO REAL
XWGHT=WGHT
C COMPUTE THE DENSITY OF SHIPMENT.
XDEN=XWGHT/XCUBE
VAL=XDEN
C TABULATE THE FREQUENCY OF DENSITY.
DO 70 I=1,20
IF(VAL.LT.DCUT(I))GO TO 80
70 CCNTINUE
DREQ(I+1)=DFREQ(I+1)+1
GC TO 90
80 DFREQ(I)=DFREQ(I)+1
C COMPUTE THE TOTAL DENSITY OF A POD.
SC TDEN=TDEN+XDEN
C COMPUTE THE TOTAL SQUARED DENSITY FOR A POD.
T SDEN=T SDEN+XDEN**2
C KEEP TRACK OF HOW MANY SHIPMENTS GO TO EACH POD.
NSHIP=NSHIP+1
GC TO 20
C ESTABLISH THAT THIS IS FIRST SHIPMENT FOR A NEW POD.
21 IF(LPOD.EQ.0)GO TO 29
C COMPUTE THE AVERAGE VOLUME FOR A POD.
25 XTMP=FLOAT(NSHIP)
XAVEV=TVOL/XTMP
C COMPUTE THE STANDARD DEVIATION IN VOLUME
XSDEVV=TSVOL-(TVOL**2)/XTMP
XSDEVV=XSDEVV/XTMP
XSDEVV=ABS(XSDEVV)
XSDEVV=SQRT(XSDEVV)
C COMPUTE THE AVERAGE WEIGHT FOR A POD.
XAVEN=TWGHT/XTMP
C COMPUTE THE STANDARD DEVIATION IN WEIGHT
XSDEVW=TSWGHT-(TWGHT**2)/XTMP
XSDEVW=XSDEVW/XTMP
XSDEVW=ABS(XSDEVW)
XSDEVW=SQRT(XSDEVW)
C COMPUTE THE AVERAGE DENSITY FOR A POD.
XAVED=TDEN/XTMP
C COMPUTE THE STANDARD DEVIATION IN DENSITY
XSDEVVD=TSDEN-(TDEN**2)/XTMP

```



```

XSDEVD=XSDEVD/XTMP
XSDEVD=ABS(XSDEVD)
XSDEVD=SQRT(XSDEVD)
C STCR THE VOLUME FREQUENCY FOR PRINTOUT AT END CF PROGRAM.
DO 100 I=1,21
SVFREQ(N,I)=VFREQ(I)
CONTINUE
C STCR THE WEIGHT FREQUENCY FOR PRINTOUT AT END CF PROGRAM.
DO 150 I=1,21
SWFREQ(N,I)=WFREQ(I)
CONTINUE
C STCR THE DENSITY FREQUENCY FOR PRINTOUT AT THE END OF THE PROGRAM
DO 170 I=1,21
SDFREQ(N,I)=DFREQ(I)
CONTINUE
C STCR THE TOTAL NUMBER OF SHIPMENTS FOR EACH POD.
NSHIP(N)=NSHIP
C STCR TOTAL VOLUME FOR PRINTOUT AT END OF PROGRAM.
STVOL(N)=TVOL
C STCR AVERAGE VOLUME FOR PRINTOUT AT END OF PROGRAM.
XAVEV(N)=XAVEV
C STCR STANDARD DEVIATION OF VOLUME FOR PRINTOUT AT END OF PROGRAM.
SDEVV(N)=XSDEVV
C STCR TOTAL WEIGHT FOR PRINTOUT AT END OF PROGRAM.
STWGT(N)=TWGHT
C STCR AVERAGE WEIGHT FOR PRINTOUT AT END OF PROGRAM.
XAVEW(N)=XAVEW
C STCR STANDARD DEVIATION OF WEIGHT FOR PRINTOUT AT END OF PROGRAM.
SDEW(N)=XSDEW
C STCR AVERAGE DENSITY FOR PRINTOUT AT END OF PROGRAM.
XAVED(N)=XAVED
C STCR STANDARD DEVIATION OF DENSITY FOR PRINTOUT AT END OF PROGRAM.
SDEV(N)=XSDEV
C SET ALL COMPUTATIONAL ELEMENTS TO ZERO TO PROCESS NEXT POD.
29 IF(ENDFLG.EQ.2)GO TO 31
TVOL=0
TWGHT=0
TSWGT=0
TDEN=0
TSDEN=0
NSHIP=0
C SET ALL FREQUENCY COUNTERS BACK TO ZERO TO PROCESS NEXT POD.
DO 200 I=1,21
VFREQ(I)=0
CONTINUE
DO 210 I=1,21
W.FREQ(I)=0

```



```

210 CCNTINUE
DO 220 I=1,21
DPRQ(I)=0
220 CCNTINUE
LPCD=PCD
C INCREMENT COUNTER FOR NEW POD.
N=N+1
C STCR=POD FOR PRINTOUT AT END OF PROGRAM.
SPOD(N)=POD
C START TO TABULATE THE FREQUENCIES FOR NEXT POD.
GO TO 23
27 ENDFLG=2
IF(ENDFLG.EQ.2)GO TO 25
C WRITE OUT THE FREQUENCY DATA FOR VOLUME BY POD.
31 WRITE(6,2)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED VOLUMES.
WRITE(6,5)
WRITE(6,6)
WRITE(6,7)
C BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
WRITE(6,1)
WRITE(6,1)
DC 300 N=1,110
C WRITE(6,14)N,SPOD(N),(SVFREQ(N,I),I=1,21),SNSHIP(N)
300 CCNTINUE
C WRITE OUT FREQUENCY DATA FOR WEIGHT BY POD.
WRITE(6,3)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED WEIGHTS.
WRITE(6,8)
WRITE(6,9)
WRITE(6,10)
C BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
WRITE(6,1)
WRITE(6,1)
DC 350 N=1,110
C WRITE(6,15)N,SPOD(N),(SWFREQ(N,I),I=1,21),SNSHIP(N)
350 CCNTINUE
C WRITE OUT FREQUENCY DATA FOR DENSITY BY POD.
WRITE(6,4)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED DENSITIES.
WRITE(6,11)
WRITE(6,12)
WRITE(6,13)
C BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
WRITE(6,1)
WRITE(6,1)
DC 400 N=1,110
C WRITE(6,16)N,SPOD(N),(SDFREQ(N,I),I=1,21),SNSHIP(N)

```



```

400 CONTINUE
C PRINT HEADING FOR CONSOLIDATED INFORMATION FOR EACH POD.
  WRITE(6,18)
C PRINT REQUIRED COLUMN HEADINGS FOR CONSOLIDATED INFORMATION.
  WRITE(6,19)
C BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE
  WRITE(6,1)
  WRITE(6,1)
C WRITE OUT CONSOLIDATED DATA FOR EACH POD.
  DO 450 N=1,110
    WRITE(6,17)N,SPOD(N),SNSHIP(N),STVOL(N),SXAVEV(N),SSDEVV(N),STWGT
    1(N),SXAVEW(N),SSDEWV(N),SXAVED(N),SSDEVD(N)
  450 CONTINUE
      STOP
      END

```


COMPUTER PROGRAM THREE

```

C THIS PROGRAM IS DESIGNED TO RECORD THE DAILY VOLUME, WEIGHT, AND NUMBER
C OF SHIPMENTS THAT ARRIVE AT THE CONTAINER STUFFING STATION DURING THE
C PERIOD OF TIME UNDER CONSIDERATION.
  IMPLICIT INTEGER*4 (A-W)
  INTEGER*2 DT
  DIMENSION SNSHIP(123), SVOL(123), SWGHT(123)
  DATA SNSHIP/123*0/, SVOL/123*0/, SWGHT/123*0/
  1 FORMAT(A3,A4,A2,A1,A4,A4,A2,A2,A3,A4)
  2 FORMAT(2X, DAY, ', ', I6, 3(I10), '/')
  3 FORMAT('1 THE FOLLOWING TABLE IDENTIFIES THE DAILY ARRIVAL OF CARGO
  1 AT THE CONTAINER STUFFING STATION BY NO. SHIP., VOLUME, AND WEIGH
  2 T. ')
  4 FORMAT('0 DAYS NO. SHIP VOLUME WEIGHT')
  5 FORMAT(3X, ' TOTAL WEIGHT = ', I10, 3X, ' TOTAL VOLUME = ', I10)
  TWGHT=0
  TVOL=0
C READ A SHIPMENT FROM DATA CELL.
  20 READ(13,1,END=27)POD,CN1,CN2,EHC,CUBE,WGHT,PCS,DT,CC,TAC
C INCREMENT THE NO. SHIPMENT AND VOLUME ARRAY FOR GIVEN DATE.
  25 SNSHIP(N)=SNSHIP(N)+1
  SVOL(N)=SVOL(N)+CUBE
  SWGHT(N)=SWGHT(N)+WGHT
  TWGHT=TWGHT+WGHT
  TVOL=TVOL+CUBE
C GO BACK AND READ ANOTHER SHIPMENT.
  GO TO 20
C PRINT HEADING FOR TABLE.
  27 WRITE(6,3)
  28 WRITE(6,4)
C TWO BLANK WRITE CARDS TO SKIP TWO SPACES BEFORE NEXT LINE.
  WRITE(6,1)
  WRITE(6,1)
C PRINT DO 200 I=1,123
  WRITE(6,2)I,SNSHIP(I),SVOL(I),SWGHT(I)
C TWO CONTINUE
  CONTINUE
  200 BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING
  WRITE(6,1)
  WRITE(6,1)
  WRITE(6,5)TWGHT,TVOL
  STOP
END

```


COMPUTER PROGRAM FOUR

```

C THIS PROGRAM IS DESIGNED TO COMPUTE THE NUMBER OF SHIPMENTS THAT ARE A
C SSCC IMPLICIT INTEGER#4 (A-W)
C DIMENSION EFREQ(27),SEFREQ(1822,27),SPOD(1822),SCN1(1822),SCN2(182
12),C(26)
C DATA C/A,'B','C','D','E','F','G','H','I','J','K','L','M','N','O',
1,P,'Q','R','S','T','U','V','W','X','Y','Z,/
1,FORMAT(A3,A4,A2,A1,A4,A2,A2,A3,A4)
2,REFERENCE OF THE FOLLOWING TABLE IDENTIFIES THE FREQUENCY OF OCCU
3,FORMAT(0 NQ. POD CON A R S T U V W X Y Z
1 K L
2 OTHER)
4,FORMAT(1X,I4,2X,A3,1X,A4,A2,25(1X,I3),2(2X,I4))
ENDEFLG=1
LCN1=0
LCN2=0
N=0
C READ A CONSIGNEE SHIPMENT FROM DATA CELL.
20 READ(13,1,END=27)POD,CN1,CN2,EHC,CUBE,WGHT,PCS,DT,CC,TAC
23 IF((LCN1.NE.CN1).OR.(LCN2.NE.CN2))GO TO 21
23 DO 50 I=1,26
50 IF(EHC.EQ.C(I))GO TO 60
50 CONTINUE
EFREQ(27)=EFREQ(27)+1
GO TO 20
60 EFREQ(I)=EFREQ(I)+1
C GO BACK AND READ ANOTHER SHIPMENT FROM DATA CELL.
GO TO 20
21 IF(LCN1.EQ.0)GO TO 29
C STORE DATA FOR PRINTOUT AT END OF PROGRAM.
30 DO 100 I=1,27
100 SEFREQ(N,I)=EFREQ(I)
50 CONTINUE
IF(ENDEFLG.EQ.2)GO TO 31
29 DO 200 I=1,27
200 EFREQ(I)=0
50 CONTINUE
LCN1=CN1
LCN2=CN2
C INCREMENT COUNTER FOR A NEW CONSIGNEE.
N=N+1
C STORE POD AND CN1,CN2 FOR PRINTOUT AT END OF PROGRAM.
SPOD(N)=POD
SCN1(N)=CN1
SCN2(N)=CN2
C GO BACK AND PROCESS CONSIGNEE.
GO TO 23

```



```

27 ENDFLG=2
   IF (ENDFLG.EQ.2) GO TO 30
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED DATA
31 WRITE(6,2)
C BLANK WRITE(6,3) STATEMENTS TO SKIP TWO LINES BEFORE TABLE ENTRIES
   WRITE(6,1)
   WRITE(6,1)
C PRINTOUT OF SHIPMENT DATA
DC 250 N=1,1822
WRITE(6,4) N, SPUD(N), SCN1(N), SCN2(N), (SEFREQ(N,I), I=1,27)
250 CCNTINUE
      STOP
      END

```


127

```

C STORE 21 FREQUENCIES FOR PRINTOUT AT END OF PROGRAM.
      IF (CONTINUES) GO TO 29
      I = 1
      DO 10 J = 1, 20
      10  FREQ(J) = 0
      CONTINUE
      GO TO 29
      END

```



```

      SCFREQ(N,I)=CCFREQ(I)
80  CCNTINUE OF SHIPMENTS FOR PRINTOUT AT END OF PROGRAM.
C  STCRE SNSHIP(N)=NSHIP
   IF(ENDFLG.EQ.2)GO TO 31
C  SET FREQUENCY COUNTERS TO ZERO.
25  DC 200 I=1,12
200 CCFREQ(I)=0
   CCNTINUE
   LCN1=CN1
   LCN2=CN2
   NSHIP=0
C  INCREMENT COUNTER FOR NEW CONSIGNEE.
   N=N+1
C  STCRE PCOD(N) AND CN1,CN2 FOR PRINTOUT AT END OF PROGRAM.
   SPCOD(N)=PCOD
   SCN1(N)=CN1
   SCN2(N)=CN2
C  START TO PROCESS DATA FOR CONSIGNEE.
27  ENDFLG=2
   IF(ENDFLG.EQ.2)GO TO 40
C  WRITE OUT FREQUENCY DATA ON COMMODITY CODES FOR EACH CONSIGNEE.
31  WRITE(6,2)
C  PRINT COLUMN HEADINGS FOR TABULATED VALUES.
   WRITE(6,3)
   WRITE(6,4)
C  BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE.
   WRITE(6,1)
   WRITE(6,1)
C  PRINT COMMODITY CODE FREQUENCIES.
400 DC 400 N=1,1822
   WRITE(6,6)N,SPCOD(N),SCN1(N),SCN2(N),(SCFREQ(N,I),I=1,12),SNSHIP(N)
   CCNTINUE
   WRITE(6,1)
   WRITE(6,1)
   WRITE(6,7)TSHIP
   STOP
END

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```

VCUT(10)=1500
VCUT(11)=1750
VCUT(12)=2000
VCUT(13)=3000
VCUT(14)=4000
VCUT(15)=5000
VCUT(16)=6000
VCUT(17)=8000
VCUT(18)=10000
VCUT(19)=15000
VCUT(20)=25000
WCUT(1)=000
WCUT(2)=050
WCUT(3)=100
WCUT(4)=200
WCUT(5)=400
WCUT(6)=600
WCUT(7)=800
WCUT(8)=1000
WCUT(9)=1250
WCUT(10)=1500
WCUT(11)=2000
WCUT(12)=3000
WCUT(13)=5000
WCUT(14)=7500
WCUT(15)=10000
WCUT(16)=15000
WCUT(17)=20000
WCUT(18)=25000
WCUT(19)=30000
WCUT(20)=40000
ENDFLG=1
LCN1=0
LCN2=0
N=0

```

```

C READ A CONSIGNEE SHIPMENT FROM DATA CELL.
20 READ(13,1,END=27)POD,CN1,CN2,EHC,CUBE,WGHT,PCS,DT,CC,TAC
IF((LCN1.NE.CN1).OR.(LCN2.NE.CN2))GO TO 21
22 IF(LDT.EQ.DT)GO TO 73
C TABULATE THE DAILY FREQUENCY BY VOLUME.
23 VAL=TVOL
DO 24 I=2,20
IF(VAL.LT.VCUT(I))GO TO 28
24 CONTINUE
VDFREQ(I+1)=VDFREQ(I)+1
GO TO 30
28 VDFREQ(I)=VDFREQ(I)+1
C TABULATE THE DAILY FREQUENCY BY WEIGHT.

```



```

30 VAL=TWGHT
DC 40 I=2,20
IF(VAL.LT.WCUT(I))GO TO 50
40 CCNTINUE
WDFREQ(I+1)=WDFREQ(I+1)+1
GO TO 60
50 WDFREQ(I)=WDFREQ(I)+1
C KEEP TRACK OF THE NUMBER OF DAYS ON WHICH CARGO RECEIVED.
60 RCD=RCD+1
IF(ENDFLG.EQ.2)GO TO 62
C ZERO DAILY VOLUME AND WEIGHT TOTALS FOR NEW DAY.
LDT=DT
TVCL=0
TWGHT=0
IF((LCN1.NE.CN1).OR.(LCN2.NE.CN2))GO TO 62
C GC BACK AND START CALCULATIONS FOR NEW DAY.
73 TVCL=TVCL+CUBE
TWGHT=TWGHT+TWGHT
C GC BACK AND READ NEXT CARD.
GO TO 20
21 IF(LCN1.EQ.0)GO TO 29
GO TO 23
C COMPUTE VALUE OF VDFREQ(1) AND WDFREQ(1)
62 WDFREQ(1)=123-(WDFREQ(2)+WDFREQ(3)+WDFREQ(4)+WDFREQ(5)+WDFREQ(6)+W
1DFREQ(7)+WDFREQ(8)+WDFREQ(9)+WDFREQ(10)+WDFREQ(11)+WDFREQ(12)+WDFR
2EQ(13)+WDFREQ(14)+WDFREQ(15)+WDFREQ(16)+WDFREQ(17)+WDFREQ(18)+WDFR
3EQ(19)+WDFREQ(20)+WDFREQ(21))
C CONTINUE TO PROCESS DATA ON NEW CONSIGNEE.
VDFREQ(1)=123-(VDFREQ(2)+VDFREQ(3)+VDFREQ(4)+VDFREQ(5)+VDFREQ(6)+V
1DFREQ(7)+VDFREQ(8)+VDFREQ(9)+VDFREQ(10)+VDFREQ(11)+VDFREQ(12)+VDFR
2EQ(13)+VDFREQ(14)+VDFREQ(15)+VDFREQ(16)+VDFREQ(17)+VDFREQ(18)+VDFR
3EQ(19)+VDFREQ(20)+VDFREQ(21))
C CALCULATE PERCENTAGE OF DAILY ACTIVITY FOR VOLUME INTERVALS.
DC 70 I=1,21
PCTDV(I)=(VDFREQ(I)/123.)*100
70 CONTINUE
C CALCULATE PERCENTAGE OF DAILY ACTIVITY FOR WEIGHT INTERVALS.
DC 80 I=1,21
PCTDW(I)=(WDFREQ(I)/123.)*100
80 CCNTINUE
C STORE DATA FOR PRINTOUT AT END OF PROGRAM.
DC 100 I=1,21
SVDFRQ(N,I)=VDFREQ(I)
100 CONTINUE
DC 150 I=1,21
SWDFRQ(N,I)=WDFREQ(I)
150 CCNTINUE
C STORE VOLUME AND WEIGHT PERCENTAGES FOR PRINTOUT AT END OF PROGRAM.

```



```

90 DO I=1,21
   SPCTDV(N,I)=PCTDV(I)
   CCNTINUE
95 DO I=1,21
   SPCTDW(N,I)=PCTDW(I)
   CCNTINUE
   SRCD(N)=RCD
   IF(ENDFLG.EQ.2)GO TO 31
C SET ALL FREQUENCY COUNTERS BACK TO ZERO TO PROCESS NEXT CONSIGNEE.
29 DO I=1,21
   VDFREQ(I)=0
200 CCNTINUE
   DC 250 I=1,21
   WDFREQ(I)=0
250 CCNTINUE
   DC 260 I=1,21
   PCTDV(I)=0
260 CCNTINUE
   DC 270 I=1,21
   PCTDW(I)=0
270 CCNTINUE
   LCN1=CN1
   LCN2=CN2
   LDT=DT
   TVOL=0
   TWGHT=0
   RCD=0
C INCREMENT COUNTER FOR NEW CONSIGNEE.
   N=N+1
C STORE POD AND CN1,CN2 FOR PRINTOUT AT END OF PROGRAM.
   SPCD(N)=POD
   SCN1(N)=CN1
   SCN2(N)=CN2
C START TO PROCESS DATA FOR CONSIGNEE.
   GO TO 22
27 ENDFLG=2
   IF(ENDFLG.EQ.2)GO TO 23
C WRITE OUT DAILY FREQUENCY DATA FOR VOLUME BY CONSIGNEE.
31 WRITE(6,2)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED DAILY ACTIVITY.
   WRITE(6,3)
   WRITE(6,4)
   WRITE(6,5)
C BLANK STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE.
   WRITE(6,1)
   WRITE(6,1)
C PRINT DAILY VOLUME ACTIVITY.
DO 300 N=1,1822

```



```

WRITE(6,6)SPOD(N),SCN1(N),SCN2(N),(SVDFRQ(N,I),I=1,21),SRCD(N)
C PRINT DAILY PERCENTAGE OF ACTIVITY FOR VOLUME INTERVAL.
WRITE(6,7)(SPCTDV(N,I),I=1,21)
WRITE(6,1)
300 CONTINUE
C WRITE DAILY FREQUENCY DATA FOR WEIGHT BY CONSIGNEE.
WRITE(6,8)
C PRINT REQUIRED COLUMN HEADINGS FOR TABULATED DAILY ACTIVITY.
WRITE(6,9)
WRITE(6,10)
WRITE(6,11) STATEMENTS TO SKIP TWO LINES BEFORE PRINTING TABLE.
C BLANK WRITE(6,1)
WRITE(6,1)
DC 350,N=1,1822
C PRINT DAILY PERCENTAGE OF ACTIVITY FOR WEIGHT INTERVAL.
WRITE(6,12)SPOD(N),SCN1(N),SCN2(N),(SWDFRQ(N,I),I=1,21),SRCD(N)
WRITE(6,13)(SPCTDW(N,I),I=1,21)
350 CONTINUE
STOP
END

```


COMPUTER PROGRAM SEVEN

```

C THIS PROGRAM IS DESIGNED TO TAKE THE DATA WHICH WAS GENERATED BY THE
C CONTAINER STUFFING SIMULATION MODEL, WHICH USED AS ITS INPUT THE RAW
C SHIPMENT DATA FOR THE FOUR MONTH PERIOD UNDER CONSIDERATION, AND PRINT
C OUT THE ACTIVITY FOR THE 13 LARGEST PODS. THE SIMULATION MODEL WAS
C USED TO SIMULATE A TWO YEAR OPERATING PERIOD REPEATING THE RAW
C SHIPMENT DATA A TOTAL OF SIX TIMES. THE POD'S ACTIVITY BY CONTAINER
C TYPE IS PRINTED OUT FOR EACH THIRTY DAY PERIOD, WITH A SUMMARY LISTING
C FOR THE TWO YEAR PERIOD AT THE END OF THE PROGRAM.
C IMPLICIT INTEGER*4 (A-W)
C INTEGER*2 RECID,CD,POD,CT,VOLL,CU,WGHTL,WU,CSN,STLID,NCON,NSEG,NLS
C REAL*4 SCU,TSDAGE,TAAGE,SSCU,AVERAGE,STDAGE,AVECU,STDCU:SCPROP,TAGE
C 1,TSCU,TSSCU,TSCPRO,TAVECU,TSTDCU,TTADSS,TTADS,TTSTAD
C 1,FORMAT(14(A2))
C 1 IS FOR THE THIRTEEN PODS IDENTIFY THE VARIOUS CARGO PARAMETER
C 2 TYPE,
C 3 FORMAT(55X,'POD-',I2,'MONTH-',I2)
C 4 AVE.CUBE UTIL. STD.DEV.CUBE UTIL. NO.CONTAINERS AVE.AGE STD.DEV.AGE
C 5 CCN.PROP,
C 6 FORMAT(6X,I2,I2X,I4,I2X,F6.3,I2X,F6.3,I2X,F6.3,I2X,I4,I2X,F
C 16.3)
C 7 IS FOR THE THIRTEEN PODS BY CONTAINER TYPE FOR THE TWO-YEAR PERIOD.
C 1 THE FOLLOWING TABLES IDENTIFY THE VARIOUS CARGO PARAMETER
C 2 THE THIRTEEN PODS BY CONTAINER TYPE FCR THE TWO-YEAR PERIOD.
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TSCPRO(I,K)=0
TNSCT(I,K)=0
TSTTAD(I,K)=0
700 CONTINUE
710 GO TO 210
20 READ(21,1,END=999)RECID,CD,POD,CT,VOLL,CU,WGHTL,WU,CSN,STLID,NCON,
1 NSEG,NLSEG,TADSS
IF(CD.GT.DAYS)GO TO 28
C KEEP TRACK OF NUMBER OF DATED SHIPMENT SEGMENTS MONTHLY.
C KEEP TNLSEG(POD,CT)=TNLSEG(POD,CT)+NLSEG
TRACK OF AGE AND NUMBER OF DATED SEGMENTS FOR 24-MONTH PERIOD
XTADSS=TADSS
25 TAGE(POD,CT)=TAGE(POD,CT)+XTADSS
TNSHPS(POD,CT)=TNSHPS(POD,CT)+NLSEG
C KEEP TRACK OF THE NUMBER OF CONTAINERS OF EACH TYPE GOING TO EACH POD
C MONTHLY AND FOR TWO YEAR PERIOD.
TINC(POD,CT)=TINC(POD,CT)+1
TINC(POD,CT)=TINC(POD,CT)+1
C KEEP TRACK OF AGE OF DATED SHIPMENT SEGMENTS ON MONTHLY BASIS.
TTADSS(POD,CT)=TTADSS(POD,CT)+XTADSS
C SQUARE THE TOTAL AGE OF DATED SHIPMENT SEGMENTS.
STTADS(POD,CT)=STTADS(POD,CT)+XTADSS**2
TSTAD(POD,CT)=TSTAD(POD,CT)+XTADSS**2
C FIND THE CUBE UTILIZATION AND STORE IT
26 XCU=CU
SCU(POD,CT)=SCU(POD,CT)+XCU
TSCU(POD,CT)=TSCU(POD,CT)+XCU
C SQUARE THE CUBE UTILIZATION AND STORE IT
SSCU(POD,CT)=SSCU(POD,CT)+XCU**2
TSSCU(POD,CT)=TSSCU(POD,CT)+XCU**2
C KEEP TRACK OF THE NUMBER OF SINGLE CONSIGNEE CONTAINERS GOING TO A POD
GO TO 20
C COMPUTE THE AVERAGE AGE OF CARGO BY CONTAINER TYPE GOING TO POD.
28 DO 40 I=1,13
DC 40 K=1,16
IF(TNLSEG(I,K).EQ.0)GO TO 30
Z=FLOAT(TNLSEG(I,K))
AVEAGE(I,K)=TTADSS(I,K)/Z
30 CONTINUE
40 CONTINUE
C COMPUTE THE STANDARD DEVIATION IN AGE OF CARGO BY CONTAINER TYPE
C GLING TO POD.
DC 60 I=1,13
DC 60 K=1,16
IF(TNLSEG(I,K).EQ.0)GO TO 50
Y=FLOAT(TNLSEG(I,K))

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      STADAGE(I,K)=STTADS(I,K)/Y-(TTADSS(I,K)**2)/Y
      STDAGE(I,K)=STDAGE(I,K)/Y
      STDAGE(I,K)=ABS(STDAGE(I,K))
      STDAGE(I,K)=SQRT(STDAGE(I,K))
50  CONTINUE
60  CONTINUE
      C COMPUTE THE AVERAGE CUBE UTILIZATION BY CONTAINER TYPE FOR EACH POD.
      DO 80 I=1,13
      DO 70 K=1,16
      IF(TNC(I,K).EQ.0)GO TO 70
      Z=FLOAT(TNC(I,K))
      AVECU(I,K)=SCU(I,K)/Z
70  CONTINUE
      C COMPUTE THE STANDARD DEVIATION OF CUBE UTILIZATION BY CONTAINER TYPE
      C FOR EACH POD
      DO 100 I=1,13
      DO 90 K=1,16
      IF(TNC(I,K).EQ.0)GO TO 90
      Y=FLOAT(TNC(I,K))
      STDCU(I,K)=SSCU(I,K)-(SCU(I,K)**2)/Y
      STDCU(I,K)=STDDEV(I,K)/Y
      STDCU(I,K)=ABS(STDDEV(I,K))
      STDCU(I,K)=SQRT(STDDEV(I,K))
90  CONTINUE
100 CONTINUE
      C COMPUTE THE SINGLE CONSIGNEE PROPORTION BY CONTAINER TYPE FOR EACH POD
      DO 120 I=1,13
      DO 110 K=1,16
      IF(TNC(I,K).EQ.0)GO TO 110
      Z=FLOAT(TNC(I,K))
      SCPRCP(I,K)=NSCT(I,K)/Z
110 CONTINUE
120 CONTINUE
      C PRINT THE HEADING FOR THE MONTHLY TABLES
      C PRINT THE HEADING FOR EACH POD, INCLUDING COLUMN HEADINGS
      C TWO BLANK LINES BEFORE PRINTING NEXT POD
      WRITE(6,1)
      WRITE(6,2)
      WRITE(6,3)I,M
      WRITE(6,4)
405 DO 400 K=1,16
      IF(AVEAGE(I,K).EQ.0)GO TO 400
      WRITE(6,5)K,AVEAGE(I,K),STDAGE(I,K),AVECU(I,K),STDCU(I,K)
      I,NSCT(I,K),SCPRCP(I,K)
400 CONTINUE

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410 CONTINUE
200 IF(CD.GT.720)GO TO 699
210 M=M+1
    DAYS=DAYS+30
    DC 230 I=1,13
    DO 220 K=1,16
    STADS(I,K)=0
    TNC(I,K)=0
    TADS(I,K)=0
    NSCT(I,K)=0
    SSCU(I,K)=0
    AVEAGE(I,K)=0
    STDAGE(I,K)=0
    AVECU(I,K)=0
    STDCU(I,K)=0
    TNLSEG(I,K)=0
    SCNPRP(I,K)=0
220 CONTINUE
230 IF(M.EQ.1)GO TO 20
    IGC TO 25
    NSCT(POD,CT)=NSCT(POD,CT)+1
    TNSCT(POD,CT)=TNSCT(POD,CT)+1
    GO TO 20
C CALCULATE THE AVERAGE AGE FOR A 24-MONTH PERIOD
699 DO 510 I=1,13
    DO 500 K=1,16
    IF(TNSHPS(I,K).EQ.0)GO TO 500
    XTNSHP=FLOAT(TNSHPS(I,K))
    TAAGE(I,K)=TAGE(I,K)/XTNSHP
500 CONTINUE
510 CONTINUE
C CALCULATE THE STANDARD DEVIATION OF AGE FOR A 24-MONTH PERIOD
    DO 530 I=1,13
    DO 520 K=1,16
    IF(TNSHP(I,K).EQ.0)GO TO 520
    XTNSHP=FLOAT(TNSHPS(I,K))
    XTSDAGE(I,K)=TSDAGE(I,K)/XTNSHP
    TSDAGE(I,K)=ABS(TSDAGE(I,K))
    TSDAGE(I,K)=SQRT(TSDAGE(I,K))
520 CONTINUE
530 CONTINUE
C CALCULATE THE AVERAGE CUBE UTILIZATION FOR A 24-MONTH PERIOD
    DO 550 I=1,13
    DO 540 K=1,16
    IF(TTNC(I,K).EQ.0)GO TO 540

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XTTNC=FLOAT(TTNC(I,K))
TAVECU(I,K)=TSCU(I,K)/XTTNC
540 CONTINUE
550 CONTINUE THE STANDARD DEVIATION OF CUBE UTILIZATION FOR 24 MONTHS.
C CALCULATE THE STANDARD DEVIATION OF CUBE UTILIZATION FOR 24 MONTHS.
DO 570 I=1,13
DC 560 K=1,16
IF(TTNC(I,K).EQ.0)GO TO 560
XTTNC=FLOAT(TTNC(I,K))
XTSTDCU(I,K)=TSSCU(I,K)-(TSCU(I,K)**2)/XTTNC
TSTDCU(I,K)=TSTDCU(I,K)/XTTNC
TSTDCU(I,K)=ABS(TSTDCU(I,K))
TSTDCU(I,K)=SQRT(TSTDCU(I,K))
560 CONTINUE
570 CONTINUE THE SINGLE CONSIGNEE PROPCRTION FOR 24 MONTH PERIOD.
C CALCULATE THE SINGLE CONSIGNEE PROPCRTION FOR 24 MONTH PERIOD.
DO 590 I=1,13
DC 580 K=1,16
IF(TTNC(I,K).EQ.0)GO TO 580
XTTNC=FLOAT(TTNC(I,K))
TSCPRO(I,K)=TNSCT(I,K)/XTTNC
580 CONTINUE
590 CONTINUE HEADING FOR TWO YEAR TABLE.
C PRINT THE HEADING FOR TWO YEAR TABLE.
C PRINT THE HEADING FOR EACH POD, INCLUDING COLUMN HEADINGS.
C TWO BLANK WRITE STATEMENTS TO SKIP TWO LINES BEFORE PRINTING NEXT POD.
DO 420 K=1,16
WRITE(6,1) I
WRITE(6,7) I
WRITE(6,4) I
DC 420 K=1,16
IF(TAAGE(I,K).EQ.0)GO TO 420
WRITE(6,5) K,TTNC(I,K),TAAGE(I,K),TSDAGE(I,K),TAVECU(I,K),TSTDCU(I,
1K),TNSCT(I,K),TSCPRO(I,K)
420 CONTINUE
430 CONTINUE
999 STOP
END

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